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DIVISION SNAP 8
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TECHNICAL MEMORANDUM

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TITLE: Design Calculations for the Improved Performance SNAP-8 Turbine

ABSTRACT

This memoranda contains the design calculations pertaining to the SNAP-8 turbine that is expected to have a performance improvement over the original design.

The basic philosophy of more rigorous flow control has been pursued in the redesign. The calculation method and interpretation are those currently in use at NASA Lewis Research Center.

It is anticipated that the improved turbine will have an efficiency 2 to 5 percentage points higher than the best SNAP-8 turbine tested to date.

i.e.: an aerothermodynamic efficiency of 57-60% is predicted.

APPROVED:

DEPARTMENT HEAD E. Eber

E. Eber

NOTE: The information in this document is subject to revision as analysis progresses and additional data are acquired.

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I. INTRODUCTION

During the testing of the SNAP-8 turbine in Rated Power Loop No. 2 and Power Conversion System No. 1 (Phase IV, Step 2) it became evident that the SNAP-8 system would be unable to produce the required 35 kw net output at the design operating conditions. Increased system parasitic losses, and liquid carryover from the boiler were the major cause of the lower system output.

Examination of the system and component performances indicated that the most fruitful place to gain a significant performance improvement with the least complexity and eventually attain the required system output, was in the turbine. Recommendations were made, as part of the SNAP-8 performance potential study (Ref. 1) which indicated that gains of several percentage points were possible.

The original SNAP-8 turbine and its performance were also reviewed by NASA LeRC Turbine Research personnel who also made recommendations as to method and feasibility of improving the turbine performance. Several meetings (Ref. 2, 3) were held with LeRC Research personnel in which each of the recommended changes were evaluated and discussed in the light of gain in performance relative to the degree of complexity of the change, effect on the machine reliability and program schedule and cost. Some of the considerations involved in this discussion are indicated in Refs. 2, 3, 4 and 5.

After due consideration of the relative merits of the NASA and AGC recommendations and philosophies, it was decided that the former was favored and would be utilized in the aerodynamic design of the turbine (Ref. 3).

II. DESIGN CONFIGURATION AND PHILOSOPHY

A. It was also decided that the overall configuration of the turbine would not be changed from the original design. It would still incorporate:

1. 4 stages
2. Impulse in each stage (as defined by zero pressure drop across the rotors)
3. 12,000 rpm
4. Dual path partial admission in the first two stages and full admission in the last two.

The physical changes are therefore to influence only the internal aerodynamics.

B. The basic philosophy then that has been followed in the design of the improved turbine has been one of greater flow control. The criteria of flow continuity has been more rigorously applied throughout the turbine. In addition, the vapor above and below the saturation line has been treated as an ideal gas with its temperative properties dictated by the Mercury Mollier diagram. This is in contrast to the treatment followed in the original design where the equilibrium characteristics of the Mollier diagram were followed and ideal gas relationships were not believed to be valid. The ideal gas approach has been utilized in this redesign on the basis of its previously successful application to the SNAP-2 (TRW) turbine and the data obtained during the SNAP-8 turbine alternator tests at AGC.

C. The requirement of better flow control (in contrast to the original AGC philosophy of free flow allowance) has been approached by consideration of:

1. Rotor blade solidity
2. Rotor and nozzle blade contours
3. Rotor/nozzle blade overlap
4. End-wall (OD and ID) treatment
5. Rotor tip clearance
6. Increased arc of admission in the second stage.

III. AERODYNAMIC CONSIDERATIONS

The considerations indicated in Paragraph II.C. are briefly as follows:

A. Rotor Blade Solidity

The recommendations of Ref. (6) have influenced the choice of rotor blade solidity. The indications of Ref. (6) are that much higher solidities are required to obtain low values of the total and suction surface diffusion parameter. NASA has correlated (Ref. 7) low values of the blade total diffusion parameter (i.e., 0.5 or less) with relatively high blading efficiency (low loss).

The increase in solidity to a required value of about 2.2 for the new turbine could be obtained either of two ways:

1. Increasing the number of blades from the present 79 to 123 and maintain the chord at 0.289 in.
2. Increase the number of blades from 79 to only 101 and increasing the chord from 0.289 in. to 0.353 in.

The ramification of (1) is the comparatively narrow blade root passage width which imposes a fabrication limitation to the extent that the Elox process only can be used. The Elox process does not achieve the continuity, surface finish and dimensional control required for very thin trailing edges that can be obtained with the Electro Chemical Milling process. The consequences of (2) are reduction of the axial clearance between rotor and nozzle diaphragm from 0.10 in. to .068 in. Inasmuch as it is anticipated that the mechanical redesign of the nozzle diaphragms may require an increase in thickness (which may result in a dangerously small axial clearance), a compromise was made. A 101 blade will be used in each stage, the blade profile being laid out on the basis of 0.353 in. chord. The profile will then be cut back to 0.32 in. chord. The slightly thicker leading edge that results should not be detrimental considering the low inlet relative Mach Numbers at which we will operate, and the positive incidence of 2°-3° should be advantageous. In addition, the diffusion parameter of the larger chorded blade would be changed only slightly and the blade root passage width will no longer be a fabrication limitation.

B. Increased Arc of Admission in the Second Stage

The original SNAP-8 turbine has a 38° arc of admission in both first and second stages. Circumferential spreading of the 38° arc of admission after leaving the first stage is considered to be a distinct possibility. Limiting the arc of admission in the second stage to the same arc of admission as used in the first stage was felt by NASA to be a potential contributor to the possible poor circumferential redistribution occurring between second and third (100% admission) stages. (AGC Consultant, K. A. Salisbury, has also advised a similar approach based upon his own experience of jet spread issuing from a partial admission stage).

A larger arc of admission on the second stage should again contribute to a better circumferential distribution of flow entering the full admission third stage. Consequently two additional nozzles were added to the second stage bringing the arc of admission up to 49%.

C. Reduction in Rotor Tip Clearance

Conservative rotor tip clearances were used in the original turbine design, 0.040 inches in each stage. Originally a reduction of this clearance to .020 was considered practical. However consideration of degree of overhang,

relative temperative level and potential transient occurances led to clearances slightly larger in the front two stages, i e.: the clearances become, 0.30; 0.030; 0.025 and 0.020 in. respectively.

D. End Wall Treatment

1. Cylindrical endwalls are to be used in the new turbine. The annulus area immediately before and after a rotor row is to be the same. Any area change in the rotor row will be accommodated by change in passage width and flow angle. The contrast between the old and the new axial profile can be seen in Fig. 1. The restriction of cylindrical end walls and less radical changes in endwall geometry should inhibit extraneous radial flow movement which is considered detrimental.

2. Part of the endwall treatment is involved in the reduction of rotor tip clearance. Ref. (8) indicates that a rotor blade with modest overlap (rotor height to nozzle height) with the tip running in a closely controlled recess will have a smaller tip leakage loss than a blade with the same amount of overlap running in a free annulus (see Fig. 2). The new design (Fig. 3) will incorporate the rotor blade running in a recess but the axial and radial clearances by virtue of the size of machine will not be as small as inferred in Ref. (8). The larger axial clearance may preclude the full gain inferred in Ref. (8).

3. Another facet of the endwall treatment is the rotor/nozzle overlap. This is the difference between nozzle vane and rotor blade heights. Large amounts of overlap were used on the original turbine partly due to the area change in the rotors being forced to take place radially. The blade height requirement was established at the rotor exit and the blade tip extended cylindrically to the leading edge. Additional material was added on top of the resulting overlap in order to insure that only impulse conditions could occur across the rotor.

Current practice successfully used at LeRC is to use minimal overlap, (enough to allow for fabrication tolerance) with the blade tip running in a recess. The amounts of overlap recommended by NASA at rotor blade tip are of the order of 0.005 to 0.010 inches. However, examination of the penalties that may be incurred by having too much or too little overlap indicate a greater penalty from having too little overlap. Fabrication tolerances on nozzle and

rotor blade O. D.'s amount to ± .004 inches while experienced housing distortions (Ref. 11) at the nozzle O. D.'s have shown ovalities of the order of 0.009 inches T. I. R. To insure that the rotor blade tip will at no time run at a diameter less than that of the nozzle O. D. (i. e.: the overlap should always be finite) therefore requires a rotor nozzle overlap considerably in excess of 0.005 to 0.010 inches. The overlaps to be used in the new turbine are shown in Tables 2 and 2a and are compared with the overlap used on the original turbine. An axial profile of the new turbine is shown in Figure 3.

E. Rotor and Nozzle Vane Profile

Flow control in the nozzle and rotor blade passages is coupled with choice of solidity, and eventually diffusion parameter. By use of the NASA blade surface velocity computer program the blade surface velocities were computed for pressure and suction surfaces at the hub, mean and tip sections and the diffusion parameters calculated. The computer program is essentially the method outlined in Ref. (9) and modified in Ref. (10). Values of rotor and nozzle solidities and aspect ratios are shown in Tables 2 and 2A.

The blade profiles have been drawn with straight suction surfaces upstream of the channel inlet opening, and downstream of the channel exit toward the trailing edge. The leading and trailing edge thicknesses have been reduced from 0.020 and .012 inches to 0.010 and .006 inches respectively.

Rotor blade surface velocity distributions are shown in Fig. 5 and the values of total diffusion parameter on page 30 of the accompanying calculations. The assumed meridional rotor passage velocity distributions, based upon the calculated blade inlet and exit relative velocities, show good agreement (Fig. 4) with the results obtained from the computer. The velocity level appears to be about 5% lower than assumed, however, consideration of fabrication tolerance on blade profile could lower this difference to less than 1%.

The level of total diffusion parameter is higher than originally anticipated, however, from the degree of reaction as defined in Ref. 7 and 12, indicate values of the parameter of 0.6 to 0.7 are in order for the imposed "impulse" condition of zero pressure drop across the rotor and the desired free stream velocity diagrams.

Typical rotor blade and nozzle vane profiles are shown in Fig. 6. It is to be noted that to reduce fabrication cost and time identical rotor blade and nozzle vane profiles have been utilized in all stages.

IV. Anticipated Performance

Accompanying the aerodynamic changes previously described is a change in the mechanical design which should also contribute to performance improvement. The clearance space over nozzle vanes, previously incorporated to take into account transient thermal expansions will be eliminated. The anticipated improvement in efficiency over the original design is calculated (Ref. 1) to be as follows:

1.	Reduction in rotor tip clearance	1 to 1.5 points
2.	Removal of nozzle vane tip clearance	0 to 1.5 points
3.	Better flow continuity (change in rotor solidity, endwall effects, etc.)	1 to 2.0 points
	Net Gain	2.0 to 5.0 points

The nominal performance achieved with a SNAP-8 turbine to date is 55% efficiency (Ref. 12) with 4% liquid carryover from the boiler. Thus the anticipated aerthermodynamic efficiency from the redesigned turbine is 57% to 60% at the same operating conditions.

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Design Calculations

June 24th 1966
M.S.C

The operating conditions for the improved performance Snap-8 turbine are to be; (ref: 12.)

Inlet pressure	psia	237
Inlet temperature	°F	1250
Exit pressure	psia	14.5
Exit temperature	°F	675
Mercury flow rate	lb/hr	11,600

Required stage diagram efficiency % 74.0 (Total total)
Required net efficiency % ≈60.0 (total to static)
Impulse conditions in each stage

Assumptions:

The following have been assumed in the calculations,

1. A 4% total pressure drop across each nozzle.
2. Approximately equal isentropic enthalpy drop across each stage
3. No carry-over from one stage to the next.
4. The thrust reduction seal has been elimmated.
5. Temperature and pressure state points will be those as indicated by the Mollier diagram.
6. Constant value of γ throughout entire flow process. ($\gamma = 1.667$)
7. Contant value of c_p throughout entire flow process ($c_p = 0.0248$) BTU/lb/°F).
8. Pitch-circle unchanged at 5.1 ins dia., each stage.

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9. Parasitic losses in the turbine (windage, pumping scavenging, mixing losses etc) leave the turbine via housings, shafts and bearing lubricant.

10.

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Nomenclature

T	temperature	°F, °R.
p	pressure	psia
ρ	density	lb/in^3
C_p	Specific heat at constant pressure	BTU/lb-°F
γ	C_p/C_v	
h	enthalpy	BTU/lb
V_{cr}	sonic velocity at stagnation temperature T'	ft/sec
V	absolute velocity	ft/sec
W	relative velocity	ft/sec

Subscripts:

0	before nozzle
1	between nozzle and rotor
2	rotor exit
m	values from the Mercury Mollier diagram

Superscripts

'	stagnation
"	relative stagnation state

1ST Stage:

for the whole turbine;

inlet enthalpy $h_1 = 161.75$ BTU/lb

exit enthalpy $h_2 = 129.71$ BTU/lb

$\Delta h_{1s} = 34.04$

therefore for the first stage assume $(\Delta h_{1s})_1 = \frac{34.04}{4} = 8.51$ BTU/lb

Across the whole stage, using the perfect gas relationship,

$$\frac{p_2'}{p_0'} = \left[1 - \frac{\Delta h_{1s}}{c_p T_1}\right]^{\frac{\gamma}{\gamma-1}} = \text{total (stagnation) pressure ratio across stage.}$$

$p_0' = 237$ psia

$T_1 = 1250°F$

$$= \left[1 - \frac{8.51}{0.0248 \times 1710}\right]^{\frac{1.66}{.66}}$$

$= 0.571$

thus $p_2' = 0.571 \times 237 = 135.5$ psia

also at the nozzle inlet,

$$\rho_0' = \frac{237 \times 144}{7.73 \times 1710} = 2.583 \frac{lb}{ft^3} \quad \& \quad V_{cr_0} = \sqrt{\left(\frac{2 \times 1.66}{1.66+1}\right) \times 32.2 \times 7.73 \times 1710}$$

$= 729$ fps.

and $(\rho' V_{cr})_0 = 2.583 \times 729 = 1885 \frac{lb}{sec\text{-}ft^2}$

while at the nozzle exit, since it is assumed $\frac{p_1'}{p_0'} = 0.96$

$$(\rho' V_{cr})_1 = .96 \times 1885 = 1810 \frac{lb}{sec\text{-}ft^2}$$

Noting that the static to total pressure ratio at the nozzle exit is a function of the velocity ratio V_1/V_{cr}: select a value of $V_1/V_{cr} = 0.902$,

then $$\frac{p_1}{p_1'} = \left[1 - \frac{\gamma-1}{\gamma+1}\left(\frac{V_1}{V_{cr}}\right)^2\right]^{\frac{\gamma}{\gamma-1}}$$

$$= \left[1 - 0.25\,(.902)^2\right]^{2.5} = 0.566$$

thus $p_1 = 0.566 \times .96 \times 237 = \underline{128.8}$ psia

From the Mollier diagram, for the selected Δh_{is}, there is good correlation, with an indicated $(p_1)_m = 129$ psia & $(T_1)_m = 950\,^\circ F$ $(1410\,^\circ R)$, $\chi = 0.995$

and $$\rho_1 = \frac{128.8 \times 144}{7.73 \times 1410 \times .995}$$

$$= \underline{1.715}\ \frac{lb}{ft^3} \quad \text{while } \rho_1' = .96 \times 2.583 = 2.481\ \frac{lb}{ft^3}$$

then $$\left(\frac{\rho_1}{\rho_1'}\right)_{mol} = \frac{1.715}{2.481} = \underline{0.692} \quad \text{and} \quad \rho_1 = .1692 \times 2.481 = \underline{1.715}\ \frac{lb}{ft^3}$$

note also that $$\frac{\rho_1}{\rho_1'} = \left[1 - \frac{\gamma-1}{\gamma}\left(\frac{V_1}{V_{cr}}\right)^2\right]^{\frac{1}{\gamma-1}}$$

$$= \left[1 - 0.25\,(.902^2)\right]^{1.5} = \underline{0.711}$$

this value is comparable to the ratio from the Mollier diagram.

The nozzle efflux velocity $= 729 \times .902 = 657$ fps $= V_1$

with $U = 12000\,(RPM) \times \pi \times 5.1(ins)/720 = \underline{267.5}$ ft/sec

the free stream velocity triangle between nozzle and rotor is;-

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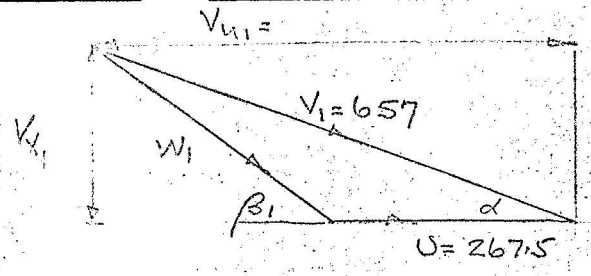
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$\alpha = 17.0°$

$V_{x_1} = 657 \sin 17$
$= 191.7$ fps.



thus annular area

$$= \frac{\dot{w}}{\rho_1 V_{x_1}} = \frac{3.23}{1.715 \times 191.7} = 0.00983 \text{ ft}^2$$

and the annular height, remembering this stage has 38% admission

$$= \frac{0.00983 \times 144}{5.1 \times \pi \times .38} = 0.232 \text{ ins}$$

Actual stage enthalpy drop $\Delta h_{ac} = 8.51 \times .74 = 6.29 \frac{BTU}{lb}$

temperature drop across stage $= \frac{6.29}{.0248} = 253°$

thus $T_2' = 1710 - 253$
$= 1457 °R$

and $(\rho' V_{cr})_2 = 1885 \times .571 \times \sqrt{\frac{1710}{1457}} = 1169 \frac{lb}{sec\text{-}ft^2}$

thus from the continuity equation, assuming equal annular area before and after the rotor,

$$\frac{\dot{w}}{(\rho V_{cr})_2 A} = \frac{3.23}{1169 \times .00983} = 0.282 = \left(\frac{\rho_2}{\rho_1'}\right)\left(\frac{V_2}{V_{cr_2}}\right)$$

Selecting a value of $V_2/V_{cr_2} = 0.29$, we have;

V_2/V_{cr_2}	$\left[\frac{\gamma-1}{\gamma+1}\left(\frac{V_2}{V_{cr}}\right)^2\right]$	$\left[1 - \frac{\gamma-1}{\gamma+1}\left(\frac{V_2}{V_{cr}}\right)^2\right]$	$\left[1 - \frac{\gamma-1}{\gamma+1}\left(\frac{V_2}{V_{cr}}\right)^2\right]^{\frac{1}{\gamma-1}}$ $(= \rho_2/\rho_1')$	$\left[1 - \frac{\gamma-1}{\gamma+1}\left(\frac{V_2}{V_{cr}}\right)^2\right]^{\frac{\gamma}{\gamma-1}}$ $(= P_2/P_2')$	$\left(\frac{\rho_2}{\rho_1'}\right)\left(\frac{V_2}{V_{cr}}\right)$	P_2 (psia)
.290	.0210	0.979	.9781	.9795	.281	128.

This is close enough, continuity is satisfied and $P_1 \approx P_2$ to within 0.3 psi.

Velocity triangle.

$$\Delta V_u = \frac{\Delta h_{ac}\, gJ}{U} = \frac{6.29 \times 32.2 \times 778}{267.5} = 590 \text{ fps}$$

$V_1 = 657$ fps.
$V_{x_1} = 191.7$ fps.
$V_{u_1} = 629$ fps.

$W_{u_1} = 629 - 267.5 = 361.5$ fps

and $\beta_1 = \tan^{-1}\left(\frac{191.7}{361.5}\right) = \tan^{-1}(0.53)$

$= 27°56'$

$$W_1 = \frac{361.5}{\cos(27°56')} = 409 \text{ fps}$$

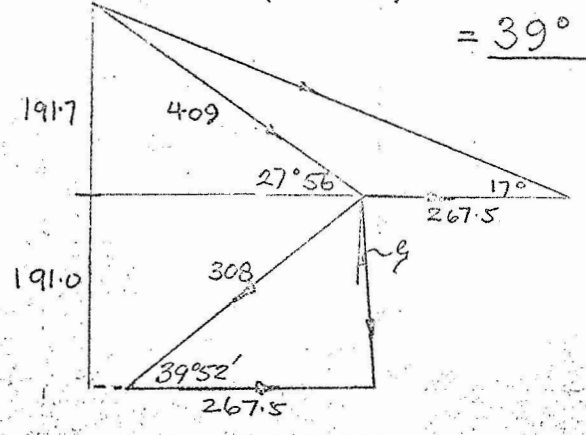
$$V_{cr_2} = 729\sqrt{\frac{1455}{1710}} = 672 \text{ fps} \qquad V_2 = 672 \times .290 = 195.0 \text{ fps.}$$

$V_{u_2} = 629 - 590 = 39$ fps. $\qquad W_{u_2} = 267.5 - 39 = 228.5$ fps.

$\zeta = \sin^{-1}\left(\frac{39}{195.0}\right) = 11°34'$ $\qquad V_{x_2} = 195 \times \cos 11°34 = 191.0$ fps

and $\beta_2 = \tan^{-1}\left(\frac{191}{228.5}\right) = \tan^{-1}(0.835)$

$= 39°52'$ & $W_2 = \frac{228.5}{\cos 39°52'} =$



Rotor Relative Temperature & Pressure

From basic relationship

$$T = T' - \frac{V^2}{2gJC_p} = T'' - \frac{W^2}{2gJC_p}$$

we have

$$\frac{T''}{T'} = 1 - \frac{V^2 - W^2}{2gJC_pT'}$$

also from the velocity triangle, $V^2 = V_x^2 + V_u^2$

$$W^2 = V_x^2 + W_u^2 = V_x^2 + (V_u - U)^2$$

by appropriate substitutions, final relationships may be derived as,

$$\frac{T''}{T'} = 1 - \frac{\gamma-1}{\gamma+1}\left(\frac{2UV_u - U^2}{V_{cr}^2}\right) = \left(\frac{\rho''}{\rho'}\right)^{\gamma-1} = \left(\frac{p''}{p'}\right)^{\frac{\gamma-1}{\gamma}}$$

thus at the rotor inlet;

$$\frac{T_1''}{T_1'} = 1 - 0.25\left(\frac{2\times 267.5\times 629 - 267.5^2}{729^2}\right)$$

$$= 0.8753$$

$$\therefore T_1'' = 1710 \times .8753 = \underline{1498^\circ R}$$

and $$\frac{p_1''}{p_1'} = (.8753)^{2.5} = 0.717$$

$$\therefore p_1'' = .717 \times .96 \times 237 = \underline{163.2 \text{ psia}}$$

at the rotor exit,

$$\frac{T_2''}{T_2'} = 1 - 0.25\left(\frac{2\times 267.5 - 267.5^2}{672^2}\right)$$

$$= 1.028$$

$$\therefore T_2'' = 1.028 \times 1457 = \underline{1499^\circ R}$$

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and $\frac{p_2''}{p_{12}'} = (1.028)^{2.5} = 1.0715$

$\therefore p_2'' = 1.0715 \times 135.5 = \underline{145.2 \text{ psia}}$

ie: $\frac{p_2''}{p_1''} = \frac{145.2}{163.5} = \underline{0.889}$

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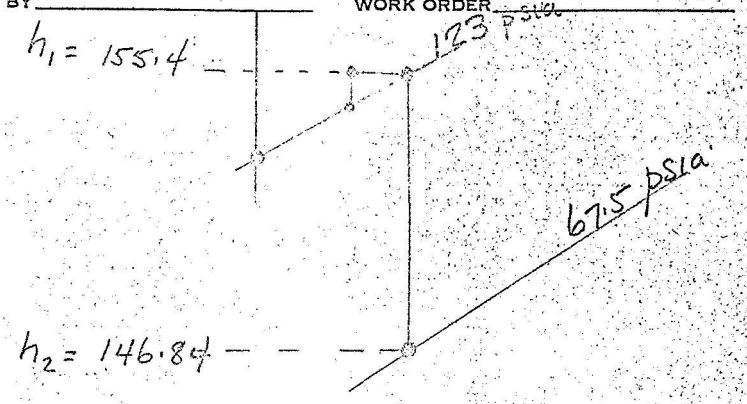
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2ND Stage

$$\Delta h_{is} = 155.4 - 146.84$$
$$= 8.56 \text{ BTU/lb}$$

$$\Delta h_{act} = 8.56 \times 0.74$$
$$= \underline{6.34} \text{ BTU/lb}$$



At the nozzle inlet

$$\rho_0' = \frac{128.8 \times 144}{7.73 \times 1455} = 1.65 \frac{lb}{ft^3}, \quad V_{cr_0} = \sqrt{1.25 \times 32.2 \times 7.73 \times 144}$$
$$= \underline{672} \text{ fps}$$

$$(\rho' V_{cr})_0 = 1.651 \times 672 = \underline{1111} \frac{lb}{ft^2\text{-sec}}$$

at the nozzle exit

$$(\rho' V_{cr})_1 = 0.96 \times 1111 = \underline{1068} \frac{lb}{ft^2\text{-sec}}$$

Selecting a value of $\frac{V_1}{V_{cr}} = 0.927$

we have,

$$\frac{p_1}{p_1'} = \left[1 - .25(.927)^2\right]^{2.5} = 0.546.$$

& $p_1 = 0.546 \times .96 \times 128.8 = \underline{67.7 \text{ psia}}$

for comparison from the Mollier diagram & corresponding to Δh_{is}, we have,

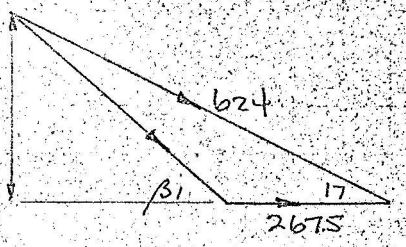
$$(p_1)_m = 67.5 \text{ psia},$$
$$(T_1)_m = 855°F \quad \chi \approx .96 \quad \text{(quality)}$$

thus at the nozzle exit, $\rho_1 = \frac{67.7 \times 144}{7.73 \times 1455 \times .96} = 0.997 \frac{lb}{ft^3}$

The nozzle efflux velocity, $V_1 = 0.927 \times 672 = 624$ fps

With $\alpha = 17°$; we have,

$V_{x_1} = 624 \sin 17° = 182.0$ fps



Interstage seal loss (ref) = .02

Annular area jet nozzle exit,

$$= \frac{3.23\,(1-.02)}{0.997 \times 182.0} = 0.01743 \text{ ft}^2$$

with 49% admission, the annular height,

$$= \frac{0.01743 \times 144}{5.1\,\pi \times .49} = 0.32 \text{ ins}$$

At the rotor exit assume $P_2' = 70$ psia $\therefore \frac{P_2'}{P_o} = 0.542$

from the Mollier $T_2' = 860°F$, $\chi = .975$

Therefore at the rotor exit,

$$(\rho' V_{cr})_2 = 1111 \times 0.542 \times \sqrt{\frac{1455}{1320} \times \frac{1.0}{0.975}} = 650 \frac{\text{lb}}{\text{ft}^2\text{-sec}}$$

and from the continuity equation, as in the first stage,

$$\frac{w}{(\rho V_{cr})_2 A} = \frac{3.165}{650 \times .01743} = 0.2795$$

Select a value of $\frac{V_z}{V_{cr_2}} = 0.29$,

$\frac{V_2}{V_{cr}}$	$\left[\frac{\gamma-1}{\gamma+1}\left(\frac{V_1}{V_{cr}}\right)^2\right]$	$\left[1-\frac{\gamma-1}{\gamma+1}\left(\frac{V_2}{V_{cr}}\right)^2\right]$	$\left[1-\frac{\gamma-1}{\gamma+1}\left(\frac{V_2}{V_{cr}}\right)^2\right]^{\frac{1}{\gamma-1}}$ $(=\rho_2/\rho_1')$	$\left[1-\frac{\gamma-1}{\gamma+1}\left(\frac{V_2}{V_{cr}}\right)^2\right]^{\frac{\gamma}{\gamma-1}}$ $(=p_2/p_1')$	$\left(\frac{\rho_2}{\rho_1'}\right)\left(\frac{V_2}{V_{cr}}\right)$	p_2
.29	.021	.979	.9686	.9483	.281	65.4
.30	.0225	.9775	.9657	.9446	.289	66.1

$\therefore$ $p_2' = 71.5$ psia, then $\frac{p_2'}{p_0} = 0.554$

Change in T_2' negligable, therefore

$$(\rho' V_{cr})_2 = 650 \times \frac{.554}{.542} = 664 \ \frac{lb}{ft^2 sec}$$

and from the continuity equation,

$$\left(\frac{\rho_2}{\rho_1'}\right)\left(\frac{V_2}{V_{cr_2}}\right) = \frac{3.165}{664 \times .01743} = 0.274$$

now select a value of $\frac{V_2}{V_{cr}} = 0.285$

.285	.0203	.9797	.9679	.950	.276	67.9

this is close enough with respect to $\left(\frac{\rho_2}{\rho_1'}\right)\left(\frac{V_2}{V_{cr}}\right)$ and matching p_1 & p_2.

Velocity triangle

$$\Delta V_u = \frac{6.34 \times 32.2 \times 778}{267.5} = 595 \text{ ft/sec}$$

$V_1 = 624$ fps.

$V_{u_1} = 624 \cos 17^\circ = 596$ fps $\quad V_{x_1} = 624 \sin 17 = 182.0$ fps

$V_{u_2} = 595 - 596 = -1$ $\quad W_{u_1} = 596 - 267.5 = 328.5$ fps

thus $\beta_1 = \tan^{-1}\left(\frac{182}{328.5}\right) = 28^\circ 59'$

and $W_1 = \frac{328.5}{\cos 28^\circ 59'} = 377$ fps

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and $(V_{cr})_2 = 672\sqrt{\frac{1320}{1455}} = 640$ fps

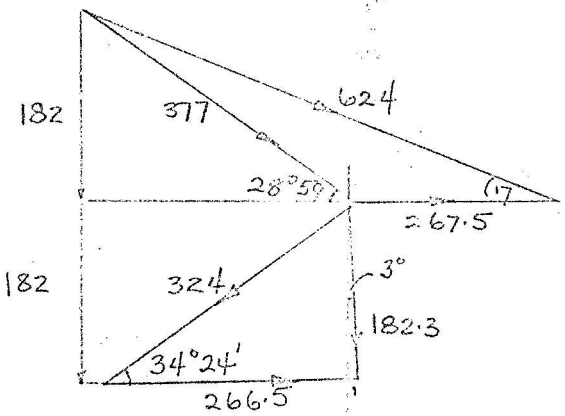
then $V_2 = 0.285 \times 640 = 182.3$ fps

$\theta = \tan^{-1}\left(\frac{1}{182.3}\right) = 3^\circ\ 9'$

$V_{X_2} = 182.0$ fps

while $\beta_2 = \tan^{-1}\left(\frac{182.}{266.5}\right) = \tan^{-1}(.684) = 34^\circ\ 24'$

and $W_2 = \frac{267.5}{\cos 34^\circ 24'} = 324$ fps



Rotor Relative Temperature & Pressure

At inlet;

$$\frac{T_1''}{T_1'} = 1 - 0.25\left(\frac{2\times 267.5\times 596 - 267.5^2}{672^2}\right)$$

$$= 1 - .1368$$

$$= 0.8632$$

$$\therefore T_1'' = .8632 \times 1457 = \underline{1257^\circ R}$$

&

$$\frac{p_1''}{p_1'} = (0.8632)^{2.5} = 0.6925$$

$$\therefore p_1'' = 0.6925 \times .96 \times 128.8 = \underline{85.5 \text{ psia}}$$

at exit;

$$\frac{T_2''}{T_2'} = 1 - 0.25\left(\frac{2\times 267.5(-1)}{640^2} - 267.5^2\right)$$

$$= 1 + .0436 = 1.0436$$

$$T_2'' = 1.0436 \times 1320 = \underline{1378^\circ R}$$

&

$$\frac{p_2''}{p_2'} = (1.0436)^{2.5} = 1.1125$$

$$\therefore p_2'' = 1.1125 \times 71.5 = \underline{79.6 \text{ psia}}$$

$$\therefore \frac{p_2''}{p_1''} = \frac{79.6}{85.5} = \underline{0.929}$$

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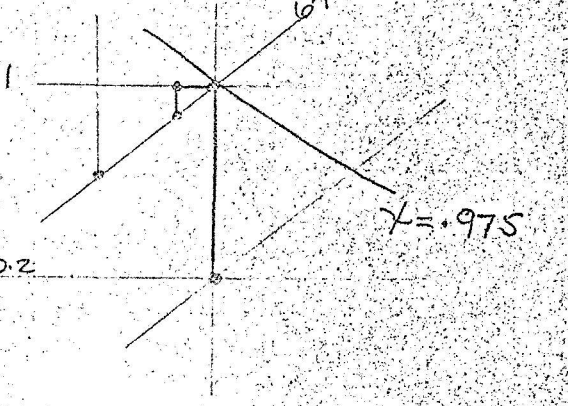
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3RD Stage

$\Delta h_{is} = 149.1 - 140.2 = 8.9$ BTU/lb

$\Delta h_{act} = 8.9 \times .74 = 6.59$ BTU/lb



At the nozzle inlet,

$$\rho_o' = \frac{67.5 \times 144}{7.73 \times 1320 \times .975} = 0.977 \frac{lb}{ft^3}$$

$$V_{cr_o} = \sqrt{1.25 \times 32.2 \times 7.73 \times 1320} = 640 \text{ fps}$$

$$(\rho' V_{cr})_o = 0.977 \times 640 = 625 \text{ fps}$$

at the nozzle exit, $(\rho' V_{cr})_1 = 0.96 \times 625 = 609$ fps.

Selecting value of $V_1/V_{cr} = 0.980$

then,

$$\frac{p_1}{p_1'} = \left[1 - 0.25(0.98)^2\right]^{2.5} = 0.503$$

& $p_1 = 0.503 \times .96 \times 67.5 = 32.6$ psia

for comparison, from the Mollier diagram & corresponding to Δh_{is}, we have,

$(p_1)_m = 32.5$ psia

$(T_1)_m = 760°F = 1220°R$ $\quad \chi \approx 0.932$

(i.e: p_1 in both instances is the same)

thus at the nozzle exit.,

$$\rho_1 = \frac{32.5 \times 144}{7.73 \times 1220 \times 0.920} = 0.531 \frac{lb}{ft^3}$$

The nozzle efflux velocity, $V_1 = 0.98 \times 640 = 626$ fps.

with $\alpha = 17°$, we have

$$V_{x_1} = 626 \sin 17° = 182.8 \text{ fps}$$

Interstage seal loss (ref) = .015

thus annular area at nozzle exit,

$$= \frac{3.23 \times .985}{0.531 \times 182.8} = 0.0328 \square'$$

while the annular height

$$= \frac{.0328 \times 144}{\pi \times 5.1} = 0.295 \text{ ins}$$

At the rotor exit, assume $p_2' = 34.5$ psia $\therefore \frac{p_2'}{p_0} = 0.511$

from the Mollier diagram, $T_2' = 765° F$ $\gamma = 0.950$

therefore at the rotor exit,

$$(\rho' V_{cr})_2 = 625 \times .511 \times \frac{.978}{.950} \times \sqrt{\frac{1320}{1225}} = 341 \frac{\text{lb}}{\text{ft}^2\text{-sec}}$$

while from the continuity equation,

$$\frac{\omega}{(\rho V_{cr})_2 A} = \frac{3.18}{341 \times 0.0328} = 0.2855$$

selecting a value of $\frac{V_2}{V_{cr}} = 0.30$

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$\frac{V_2}{V_{cr}}$	$\left(\frac{\gamma-1}{\gamma+1}\right)\left(\frac{V_2}{V_{cr}}\right)^2$	$\left[1-\left(\frac{\gamma-1}{\gamma+1}\right)\left(\frac{V_2}{V_{cr}}\right)^2\right]$	$\left[1-\left(\frac{\gamma-1}{\gamma+1}\right)\left(\frac{V_2}{V_{cr}}\right)^2\right]^{\frac{1}{\gamma-1}}$	$\left[1-\left(\frac{\gamma-1}{\gamma+1}\right)\left(\frac{V_2}{V_{cr}}\right)^2\right]^{\frac{\gamma}{\gamma-1}}$	$\left(\frac{\rho_2}{\rho_1'}\right)\left(\frac{V_2}{V_{cr}}\right)$	P_2
0.30	.0225	.9775	.9675	.9446	0.289	32.6 psia

– a satisfactory match

Velocity triangle

$$\Delta V_u = \frac{6.59 \times 32.2 \times 778}{267.5} = 618 \text{ fps}$$

$V_1 = 626$ fps $V_{u_1} = 599$ $V_{x_1} = 182.8$ fps

$V_{u_2} = -19$ $W_{u_1} = 331.5$ fps

$$V_{cr_2} = 640 \times \sqrt{\frac{1225}{1320}} = 616 \text{ fps}$$

$$\beta_1 = \tan^{-1}\left(\frac{182.8}{331.5}\right) = \tan^{-1}(0.551) = 28°52'$$

$$W_1 = \frac{331.5}{\cos 28°52'} = 378 \text{ fps}$$

$V_2 = 616 \times .30 = 184.5$ fps

$$\varphi = \sin^{-1}\left(\frac{19}{184.5}\right) = \sin^{-1}(.1027) = 5°55$$

$V_{x_2} = 184.5 \cos 5°55' = 183.2$ fps

$$\beta_2 = \tan^{-1}\left(\frac{183.2}{286.5}\right) = \tan^{-1}(0.640) = 32°38'$$

$$W_2 = \frac{286.5}{\cos 32°38'} = 340 \text{ fps}$$

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Rotor Relatwe temperature & pressore

At, inlet,

$$\frac{T_1''}{T_1'} = 1 - 0.25\left(\frac{2\times 267.5\times 599 - 267.5^2}{640^2}\right)$$

$$= 1 - 0.152 = 0.848$$

$$T_1'' = .848 \times 1320 = \underline{1120\,^\circ R}$$

&

$$\frac{P_1''}{P_1'} = (0.848)^{2.5} = 0.662$$

$$\therefore P_1' = .662 \times .96 \times 67.5 = \underline{42.9}\ \text{psia}$$

at exit,

$$\frac{T_2''}{T_2'} = 1 - 0.25\left(\frac{2\times 2675(-19) - 267.5^2}{616^2}\right)$$

$$= 1.0504$$

$$\therefore T_2'' = 1.050 \times 1225 = \underline{1288\,^\circ R}$$

while,

$$\frac{P_2''}{P_2'} = (1.050)^{2.5} = 1.1208$$

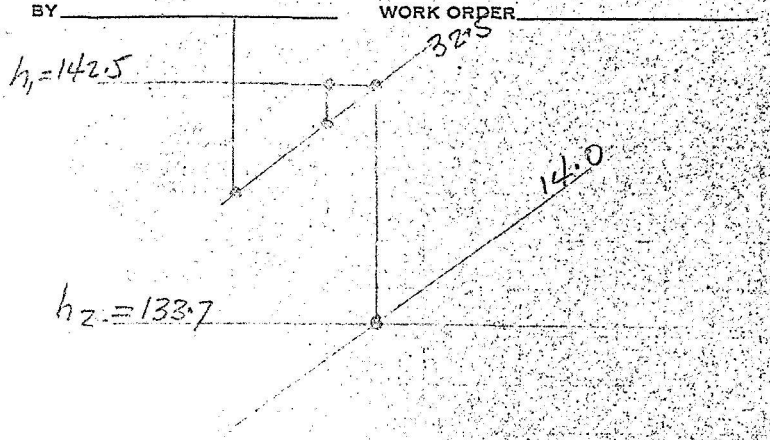
$$\therefore P_2'' = 1.1208 \times 34.5 = \underline{38.65}\ \text{psia}$$

$$\therefore \frac{P_2''}{P_1''} = \underline{0.901}$$

4th stage

$\Delta h_{is} = 142.5 - 133.7 = 8.8$ BTU/lb

$\Delta h_{act} = 0.74 \times 8.8 = 6.51$ BTU/lb



At the nozzle inlet,

$$\rho_0' = \frac{32.5 \times 144}{7.73 \times 1220 \times .945} = 0.525 \frac{lb}{ft^3}$$

$$V_{cr_0} = \sqrt{1.25 \times 32.2 \times 7.73 \times 1220} = 617 \text{ fps.}$$

$$(\rho' V_{cr})_0 = 617 \times .525 = 324 \frac{lb}{ft^2\text{-sec}}$$

and at the nozzle exit, $(\rho' V_{cr})_1 = .96 \times 324 = 311 \frac{lb}{ft^2\text{-sec}}$

Selecting a value of $\frac{V_1}{V_{cr}} = 1.045$

then,

$$\frac{p_1}{p_1'} = \left[1 - 0.25(1.045)^2\right]^{2.5} = 0.4502$$

.2578
.7422

& $p_1 = 0.4502 \times .96 \times 32.5 = \underline{14.67 \text{ psia}}$

for comparison, from the Mollier diagram, with $\Delta h_{is} = 8.8$

$(p_1)_m = 14.0$ psia

$(T_1)_m = 675°F = 1135°R$ $\quad \gamma \approx 0.905$

thus at the nozzle exit,

$$\rho_1 = \frac{14.0 \times 144}{7.73 \times 1135 \times .905} = 0.254 \frac{lb}{ft^3}$$

nozzle exit velocity $V_1 = 1.045 \times 617 = 646$ fps

with $\alpha = 17°$, we have

$$V_{x_1} = 646 \times .292 = 188.5 \text{ fps.}$$

Interstage seal leakage negligable in this stage

then annular area at nozzle exit,

$$= \frac{3.23}{0.256 \times 188.5} = 0.0669 \text{ ft}^2$$

while the annular height,

$$= \frac{.0669 \times 144}{\pi \times 5.1} = 0.602 \text{ ins}$$

at the rotor exit, assume $P_2' = 15.00$ psia $\therefore \frac{P_2'}{P_0} = 0.462$

from the Mollier diagram $T' = 679°F = 1139°R$ $\gamma = 0.912$

at the rotor exit,

$$(\rho' V_{cr})_2 = 32.4 \times .462 \times \frac{.945}{.905} \times \sqrt{\frac{1220}{1135}}^{1.03} = 161.5 \frac{\text{lb}}{\text{sec-ft}^2}$$

and from the continuity equation,

$$\frac{\dot{\omega}}{(\rho' V_{cr})_2 A} = \frac{3.23}{161.5 \times .0669} = .300$$

Selecting a value of $\frac{V_z}{V_{cr}} = 0.315$

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$\frac{V_2}{V_{cr}}$	$\left(\frac{\gamma-1}{\gamma+1}\right)\left(\frac{V_2}{V_{cr}}\right)^2$	$\left[1-\frac{\gamma-1}{\gamma+1}\left(\frac{V_2}{V_{cr}}\right)^2\right]$	$\left[1-\frac{\gamma-1}{\gamma+1}\left(\frac{V_2}{V_{cr}}\right)^2\right]^{\frac{1}{\gamma-1}}$	$\left[1-\frac{\gamma-1}{\gamma+1}\left(\frac{V_2}{V_{cr}}\right)^2\right]^{\frac{\gamma}{\gamma-1}}$	$\left(\frac{\rho_2}{\rho_1}\right)\left(\frac{V_2}{V_{cr}}\right)$	P_2
.315	0.02495	.9750	.9664	.9447	.304	14.15

this is satisfactory

Velocity triangles

$$\Delta V_u = \frac{6.51 \times 32.2 \times 778}{267.5} = 611 \text{ fps.}$$

$V_1 = 646$ fps $\quad V_{u_1} = 617 \quad V_{u_2} = 7$ fps.

$V_{x_1} = 188.5$ fps $\quad W_{u_1} = 349.5$ fps.

then $\beta_1 = \tan^{-1}\left(\frac{188.5}{349.5}\right) = \tan^{-1}(.54) = \underline{28^\circ\ 23'}$

& $W_1 = \frac{349.5}{\cos 28^\circ 23'} = \underline{398}$ fps

$V_{cr_2} = 617 \times \sqrt{\frac{1135}{1220}} = 596.0$ fps. & $V_2 = .315 \times 596 = 187.8$ fps

$\varepsilon = \sin^{-1}\left(\frac{7}{187.8}\right) = \sin^{-1}(.0373) = 2^\circ\ 8'$

$V_{x_2} = 187.8 \times \cos 2^\circ 8' = 187.7$ fps. $\quad W_{u_2} = 274.5$ fps

$\beta_2 = \tan^{-1}\left(\frac{187.7}{274.5}\right) = \tan^{-1}(.683) = \underline{34^\circ\ 20'}$

$W_2 = \frac{274.5}{\cos 34^\circ 20'} = \underline{332.5}$ fps

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Rotor Relative temperature & pressure

At inlet,

$$\frac{T_1''}{T_1'} = 1 - 0.25\left(\frac{2 \times 267.5 \times 617}{616} - 267.5^2\right)$$

$$= 1 - .163 = 0.837$$

$$T_1'' = .837 \times 1220 = 1021°R$$

& $\frac{P_1''}{P_1'} = (0.837)^{2.5} = 0.641$

$$\therefore P_1'' = .641 \times .96 \times 32.5 = \underline{20 \text{ psia}}$$

at exit,

$$\frac{T_2''}{T_2'} = 1 - 0.25\left(\frac{267.5 \times 2 \times 617}{596^2} - 267.5^2\right)$$

$$= 1.0526$$

$$\therefore T_2'' = 1.0526 \times 1135 = \underline{1195°R}$$

while

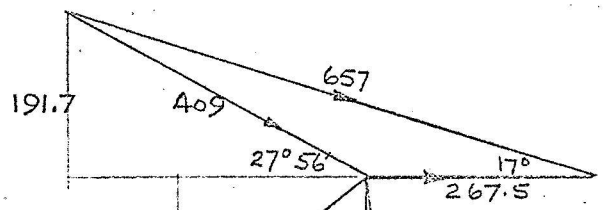
$$\frac{P_2''}{P_2'} = (1.0526)^{2.5} = 1.137$$

$$\therefore P_2'' = 1.137 \times 15.0 = \underline{17.05 \text{ psia}}$$

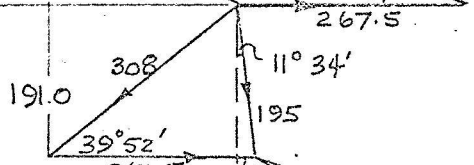
$$\therefore \frac{P_2''}{P_1''} = \frac{17.05}{20.0} = \underline{0.857}$$

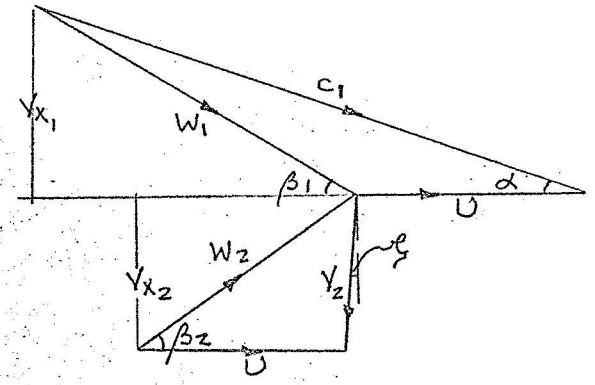
STAGE VELOCITY DIAGRAMS

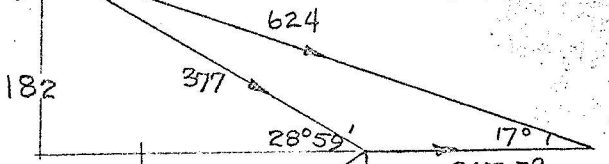
(free stream)



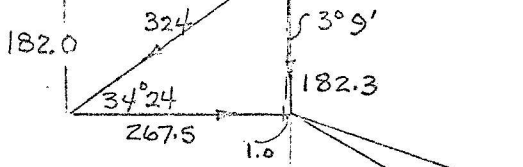
$\left(\frac{U}{C_o}\right)_1 = 0.410$

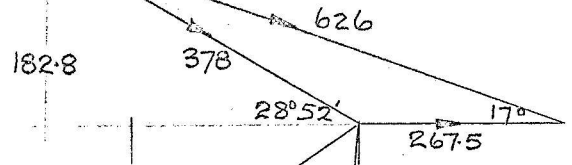




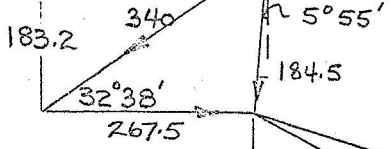


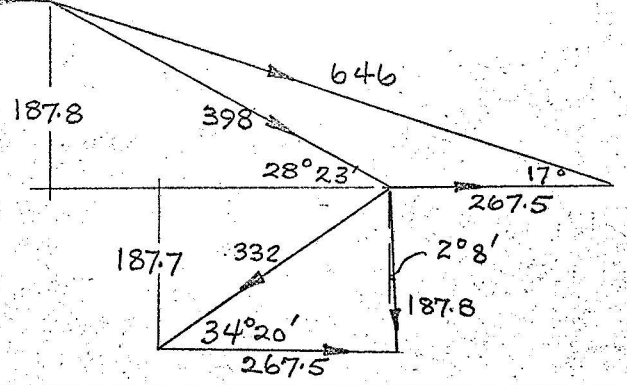
$\left(\frac{U}{C_o}\right)_2 = 0.419$





$\left(\frac{U}{C_o}\right)_3 = 0.401$





$\left(\frac{U}{C_o}\right)_4 = 0.403$

α = Nozzle Outlet angle

β_1 = Rotor Inlet angle

β_2 = Rotor Outlet angle

ζ = Rotor Outlet Swirl angle

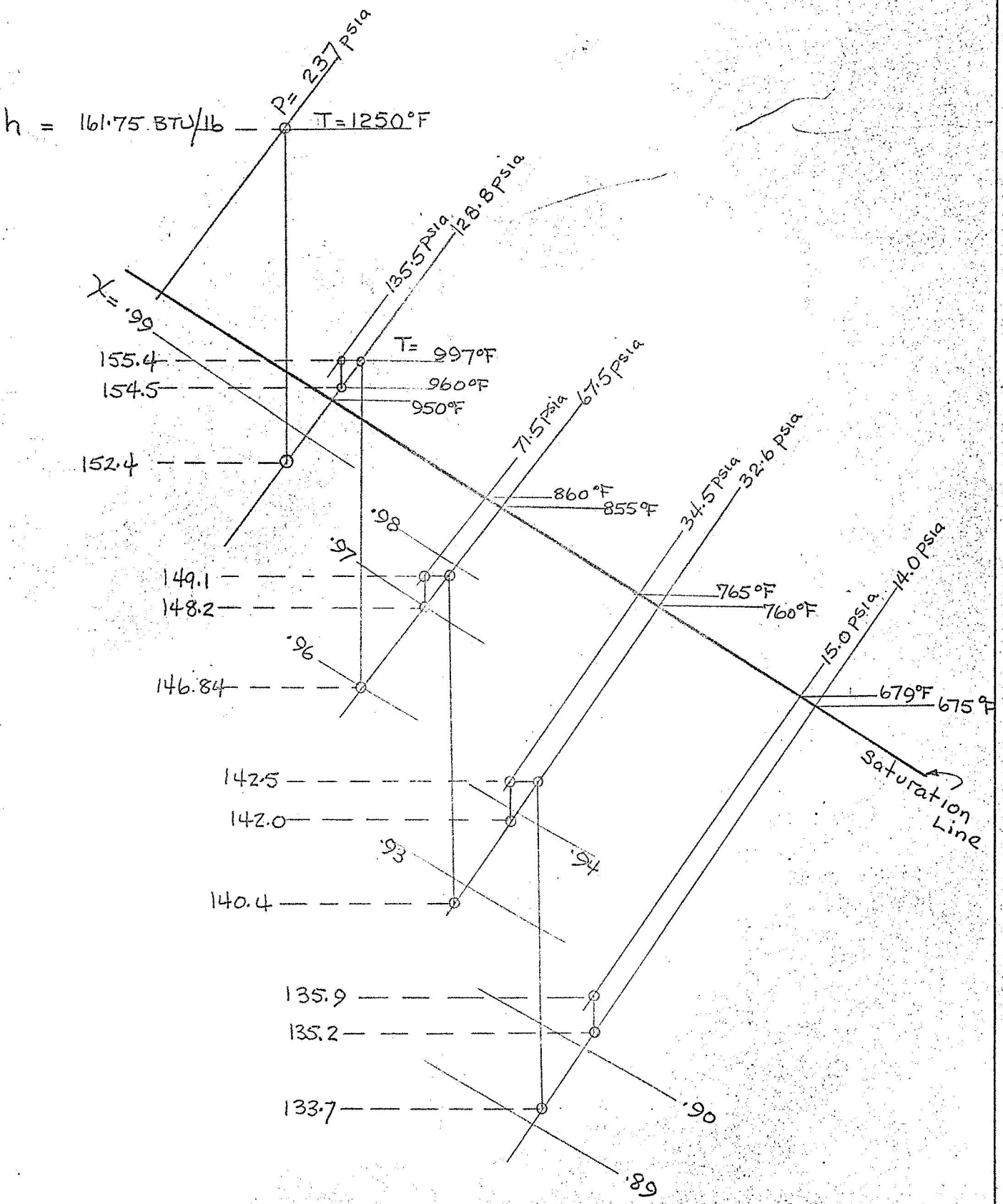
U = Tangential velocity at pitch circle diameter

C_o = Theoretical nozzle spouting velocity

V_x = Axial Velocity

p.22

TURBINE FLOW PROCESS



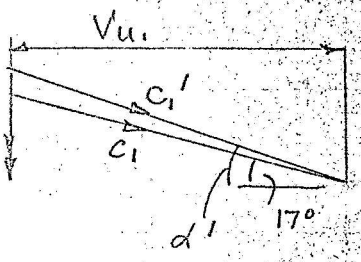
Blade Profiles

The actual blade inlet and exit angles can be calculated from the adjacent free stream velocity diagrams and the imposed blade trailing edge thicknesses.

This may be done by assuming no change in tangential velocity or loss in total pressure between the free stream and a radial plane just inside the blade row.

The resulting blades angles and velocities are used in the NASA blade surface velocity computer program which computes the actual velocities as dictated by geometry and the pressure and suction surface diffusion parameter.

Adjustment for trailing edge thickness



1ST Stage

nozzle trailing edge thickness (in all stages) = 0.010 ins

14 nozzles in 38% arc, pitch = 0.432 ins

$$\text{blockage} = \frac{.010/\sin 17^\circ}{.432} = 0.0809$$

$$\text{thus } \alpha' = \sin^{-1}\left(\frac{0.292}{1-.0809}\right) = \sin^{-1}(.3178) = 18^\circ 32' \text{ nozzle geometrical angle}$$

$$C_1' = 629/\cos 18^\circ 32' = 662 \text{ fps}$$

$$V_{u_1} = V_{u_1} = 662 \times .3178 = 210 \text{ fps} \qquad W_{u_1} = 361.5 \text{ fps}$$

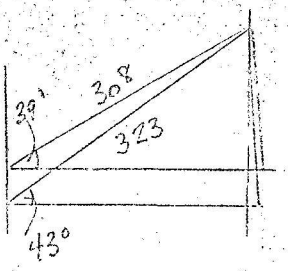
Rotor trailing edge thickness (all stages) = 0.006 ins

$\phi\ \beta_2 = 39^\circ 52'$

$$\text{then blockage} = \frac{.006}{\frac{\sin 39^\circ 52'}{\pi \times 5.11/_{.01}}} = \frac{.00936}{.1585} = .059$$

then $\beta_2' = \sin^{-1}\left(\frac{.641}{.941}\right) = \sin^{-1}(.682) = 43^\circ$

and $W_2' = 308 \times \frac{\cos 39°52}{\cos 43°} = 323$ fps.



2ND Stage

nozzle: since α & pitch are the same in each stage

$\alpha' = 18°32'$

$V_{u_1} = 596$ fps then $C_1' = \frac{596}{.948} = 630$ fps

rotor:

$\beta_2 = 34°24'$ $t = 0.006$ ins

blockage $= \frac{.006/\sin 34°24'}{.1585} = \frac{.01062}{.1585} = 0.0671$

then $\beta_2 = \sin^{-1}\left(\frac{.5649}{.9329}\right) = \sin^{-1}(.605) = 37°14'$

and $W_2' = 324 \cdot \cos 34°24'/\cos 37°14' = 336$ fps

3RD stage

nozzle as above, $\alpha' = 18°32'$

$V_{u_1} = 599$ fps then $C_1' = \frac{599}{.948} = 632$ fps

Rotor: $\beta_2 = 32°38'$ $t = 0.006$ ins

blockage $= \frac{.006/\sin 32°38}{.1585} = \frac{0.01115}{.1585} = .0704$

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then $\beta_2' = \sin^{-1}\left(\frac{.5392}{.9296}\right) = \sin^{-1}(.58) = 35°28'$

and $W_2' = 340 \cdot \cos 32°38' / \cos 35°28' = 352$ fps

4th stage

nozzle $\alpha' = 18°32'$

$V_{u_1} = 617$ fps & $c_1' = \frac{617}{.948} = 651$ fps

Rotor $\beta_2 = 34°20'$ $t = 0.006$ ins

$$\text{blockage} = \frac{0.006/\sin 34°20'}{.1585} = \frac{.01065}{.1585} = 0.0672$$

then $\beta_2' = \sin^{-1}\left(\frac{.564}{.9328}\right) = \sin^{-1}(.604) = 37°9'$

adjustment for leading edge thickness

1st stage

Rotor leading edge thickness $= 0.010$ ins

$\beta_1 = 27°56'$

$$\text{blockage} = \frac{.010/\sin 27°56'}{.1585} = \frac{.02138}{.1585} = .1345$$

$$\beta_1' = \sin^{-1}\left(\frac{.4684}{.8655}\right) = \sin(.54) = 32°45'$$

and $W_1' = 409 \frac{\cos 27°56}{\cos 32°45} = 429$ fps

– in putting back the leading edge of the 0.353 in chord blade there is an increase in passage width at the entrance of the guide channel of the rotor, from .0745 ins to .0765 ins, then W' is approximately $= 429 \times \frac{.0745}{.0765} = 418$ fps

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2ND Stage $\beta_1 = 28°59'$ $t = 0.010$ in

$$\text{blockage} = \frac{.010/\sin 28°59'}{.1585} = \frac{.02065}{.1585} = .1302$$

$$\text{then } \beta_1' = \sin^{-1}\left(\frac{.4845}{.8698}\right) = \sin^{-1}(.557) = \underline{33°51'}$$

$$W_1' = 377 \frac{\cos 28°59}{\cos 33°51} = \underline{397 \text{ fps}}$$

similarly as for the first stage, actual W_1'

$$= 397 \times \frac{.0745}{.0765} = \underline{386 \text{ fps}}$$

3RD Stage $\beta_1 = 28°52'$ $t = 0.010$ in

$$\text{blockage} = \frac{0.010/\sin 28°52'}{.1585} = \frac{.02075}{.1585} = .1308$$

$$\text{then } \beta_1' = \sin^{-1}\left(\frac{.4825}{.8692}\right) = \sin^{-1}(.556) = \underline{33°47'}$$

$$\text{then } W_1' = 378 \times \frac{\cos 28°52'}{\cos 33°47} \times \frac{.0745}{.0765} = \underline{388 \text{ fps}}$$

4th Stage $\beta_1 = 28°23'$ $t = 0.010$ in

$$\text{blockage} = \frac{0.010/\sin 28°23}{.1585} = \frac{.021}{.1585} = .1325$$

$$\text{then } \beta_1' = \sin^{-1}\left(\frac{.4753}{.8675}\right) = \sin^{-1}(.549) = \underline{33°18'}$$

$$\text{and } W_1' = 398 \frac{\cos 28°23}{\cos 33°18} \times .0745 = \underline{407 \text{ fps}}$$

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Summarising geometrical angles, velocities and relative blade velocities are:

	α_1'	β_1'	β_2'	C_1'	W_1'	W_2'
Stage 1	18° 32'	32°45	43°	662	418	323
2	18° 32'	33°51	37°14	630	386	336
3	18° 32'	33°47'	35°28	632	388	352
4	18° 32'	33°18	37° 9'	651	407	343·5

Note:- In order to ease fabrication time and cost it is desirable to use identical rotor and nozzle profiles in each stage. For the rotor then we shall select values of β_1' & β_2' of 33° and 37° respectively. This requires an adjustment in the rotor exit to ensure adequate flow area. However where the angles calculated differ from the select values of β_1 & β_2 by less than one degree (1°), no physical change will be made in blade geometry. The exit heights of rotors 1 & 3 therefore only require adjustment.

for the first stage:-

$$h_1)_{ex} = \cdot 232 \text{ ins}, \quad \therefore h_1')_{ex} = \cdot 232 \times \frac{\sin 43°}{\sin 37°} = \cdot 232 \times \frac{\cdot 682}{\cdot 601} = 0 \cdot 263 \text{ ins}$$

for the third stage:-

$$h_1)_{ex} = \cdot 295 \text{ ins}, \quad \therefore h_1')_{ex} = \cdot 295 \frac{\sin 35°28}{\sin 37°} = \cdot 295 \times \frac{\cdot 580}{\cdot 601} = 0 \cdot 284 \text{ ins}$$

- The rotor blades will be laid out with $\beta_1 = 33°$ & $\beta_2 = 37°$ using a 0·353 in chord, then the leading edge will be cut back to 0·350 ins. - The geometrical inlet angle from the layout appears to be 36°

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Rotor Blade diffusion parameters

Ref (7), indicates the desirability of values of $D_T < 0.5$. However the desire for impulse conditions has required sufficient diffusion to result in values of $D_T = 0.6$ to 0.7.

e.g.:-

By the definition of ref (7), a degree of reaction is defined by,

$$R = 1 - \frac{W_1}{W_2}$$

W_1 = blade inlet relative vel.
W_2 = blade exit relative vel.

from the blade velocities calculated in pages 24 to 27 (summarised on page 28) we have,

1 stage	$R = 1 - \frac{418}{323}$		$= -.24$
2 nd	$R =$	$1 - \frac{385}{326}$	$= -.15$
3rd	$R = 1 - \frac{385}{[illegible]}$		$= -.10$
4th	$R =$	$1 - \frac{406}{343.5}$	$= -.182$

From our requirement of pure "impulse" (no static pressure drop across the rotor), we have from our free stream velocity diagrams,

$$W_1 >> W_2$$

which results, in the blading,

$$W_1' >> W_2$$

hence the above values of "Reaction", R.

From ref (7) these values of R indicate that only high values of total diffusion parameter, D_T, are obtainable under these circumstances. Thus the values of diffusion parameter, suction and pressure surface have been obtained from the enclosed computer [illegible]

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Note:

$D_s = 1 - \frac{\text{blade exit rel. vel}}{\text{max suction surface vel.}}$

$D_p = 1 - \frac{\text{min. pressure surface vel.}}{\text{blade inlet rel. vel.}}$

and $D_T = D_s + D_p$.

stage	$\left(\frac{W}{W_{crit}}\right)_{in}$	$\left(\frac{W}{W_{crit}}\right)_{min}$	D_p	$\left(\frac{W}{W_{crit}}\right)_{ex.}$	$\left(\frac{W}{W_{crit}}\right)_{max}$	D_s	D_T
1	.595	.365	0.386	.479	.741	0.353	0.739
2	.565	.376	0.335	.504	.692	0.272	0.602
3	.627	.425	0.322	.579	.819	0.290	0.612
4	.690	.455	0.341	.760	.771	0.222	0.563

TABLE I

ROTOR BLADE OVERLAP

	Stage:	1	2	3	4
Present Design: *					
	Tip (in.)	.028	.09125	.0815	.12475
	Hub (in.)	.091	.0385	.035	.04742
New Design:					
	Tip (in.)	.034**	.019	.019	.019
	Hub (in.)	.025**	.010	.010	.010

* dimensions as fabricated

** This larger overlap a result of increased rotor exit height required as the exit angle (β_2) is reduced to 37° in common with the stages.

TABLE 2

TURBINE NOMINAL DIMENSIONS

		STAGE			
		1	2	3	4
(A) NOZZLES:					
Number		14	16	37	37
Percent Admission		38	49	100	100
Individual throat height:	ins.	.232	.320	.295	.602
Individual throat width:	ins.	.1275	.1275	.1275	.1275
Pitch:	ins.	.434	.434	.434	.434
T.E. thickness:	ins.	.010	.010	.010	.010
Chord (axial):	ins.	.30	.30	.30	.30
Throat Flow area (total):	sq. ins.	.414	.611	1.392	2.83
Exit angle:	deg.	18.5°	18.5°	18.5°	18.5°
Pitch/chord ratio:		.75	.75	.75	.75
Pitch circle diameter	ins.	5.1	5.1	5.1	5.1

TABLE 2A

			STAGE			
			1	2	3	4
(B)	BLADE ROWS:					
	Number		101	101	101	101
(1)	Blade height:	ins.	.261	.349	.335	.631
	Passage width: (inlet)	ins.	.076	.076	.076	.076
	(exit)		.0855	.0855	.0855	.0855
	Pitch:	ins.	.1585	.1585	.1585	.1585
	L.E. thickness	ins.	.010	.010	.010	.010
	T.E. thickness	ins.	.006	.006	.006	.006
	Chord:	ins.	.320	.320	.320	.320
(2)	Inlet angle:	deg.	33.0(36)	33.0 (36)	33.0 (36)	33.0 (36)
	Exit angle:	deg.	37.0	37.0	37.0	37.0
	Aspect ratio:		.812	1.09	1.048	1.97
	Pitch/chord ratio:		.495	.495	.495	.495
	Pitch circle diameter:	ins.	5.1	5.1	5.1	5.1

(1) These blade heights include .019 ins. overlap at O.D. and .010 ins. overlap at I.D.

(2) Figure in parenthesis is the geometrical angle with the rotor chord reduced from 0.353 in. to 0.320 in.

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TURBINE AXIAL PROFILE COMPARISON

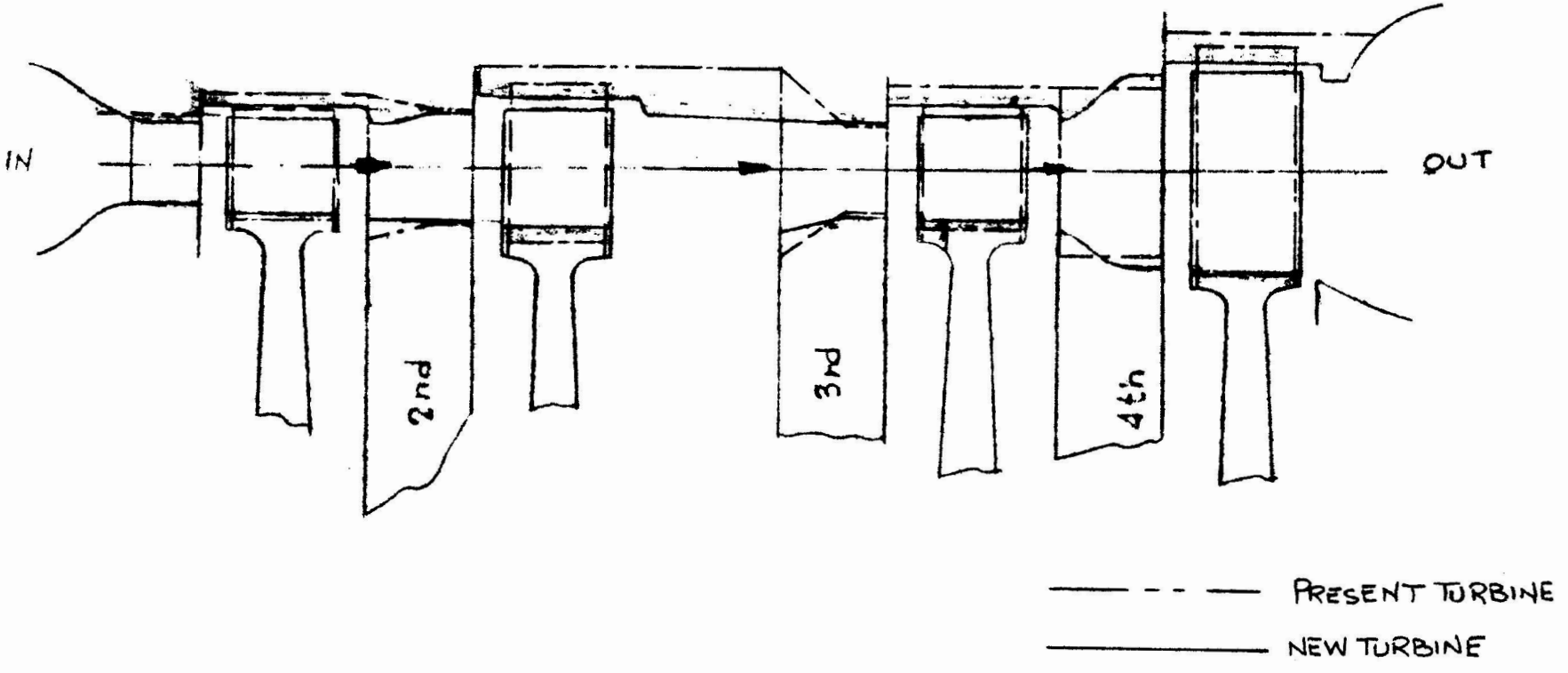
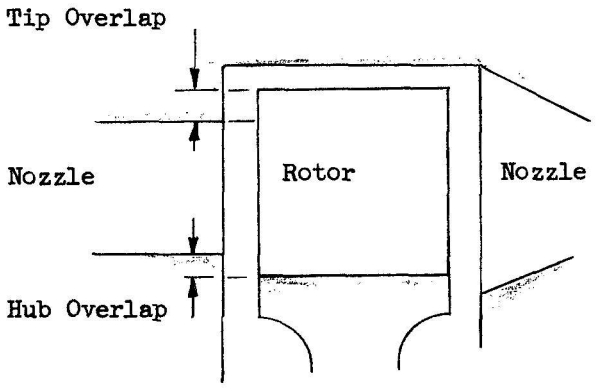


Figure 1

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NOZZLE/ROTOR RELATIONSHIP

PRESENT DESIGN



NEW DESIGN

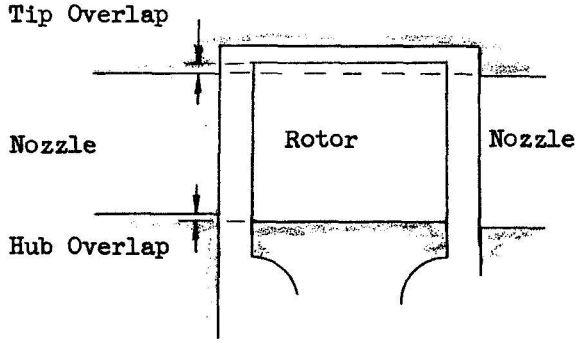
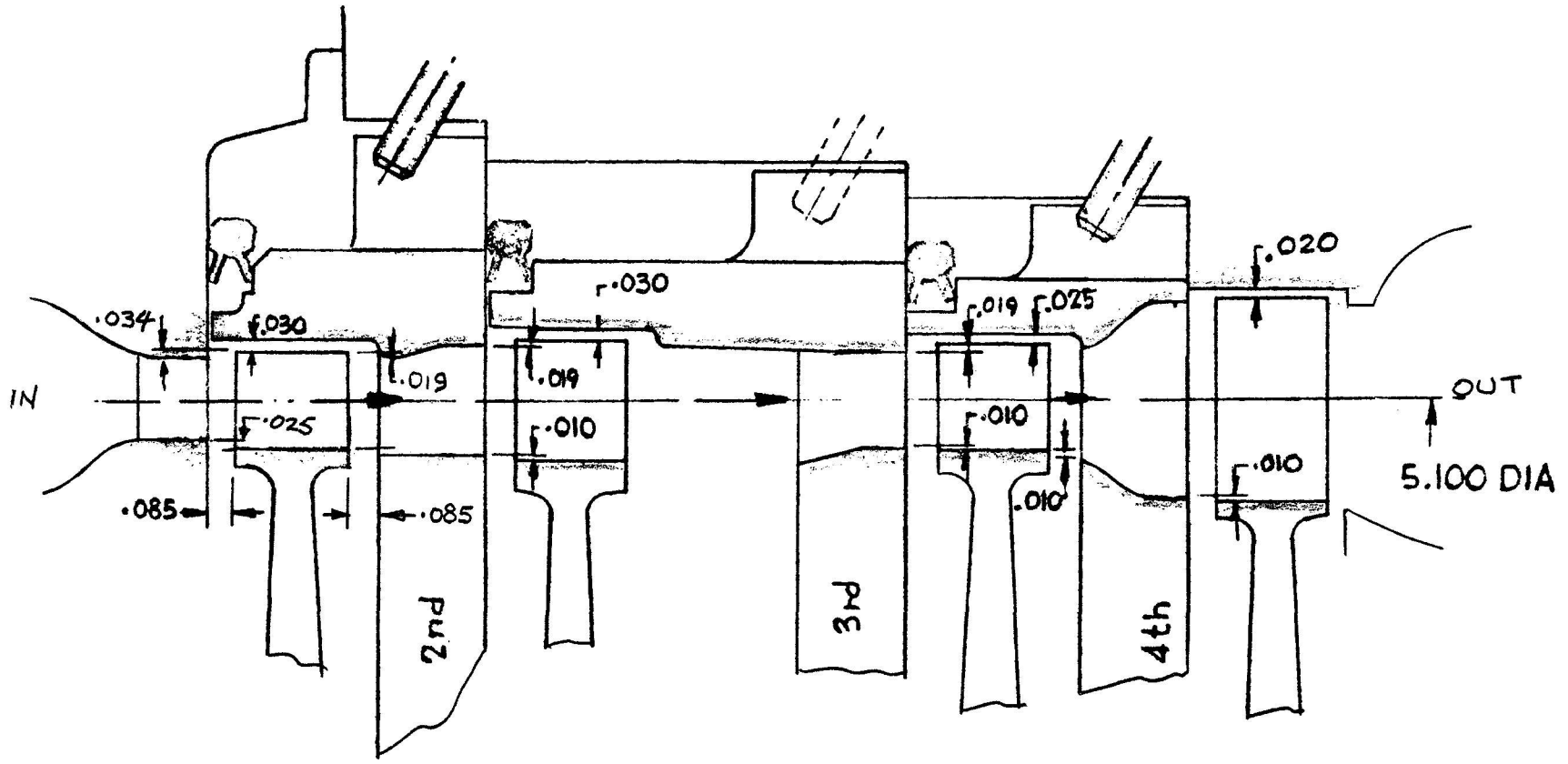


Figure 2

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TURBINE AXIAL PROFILE



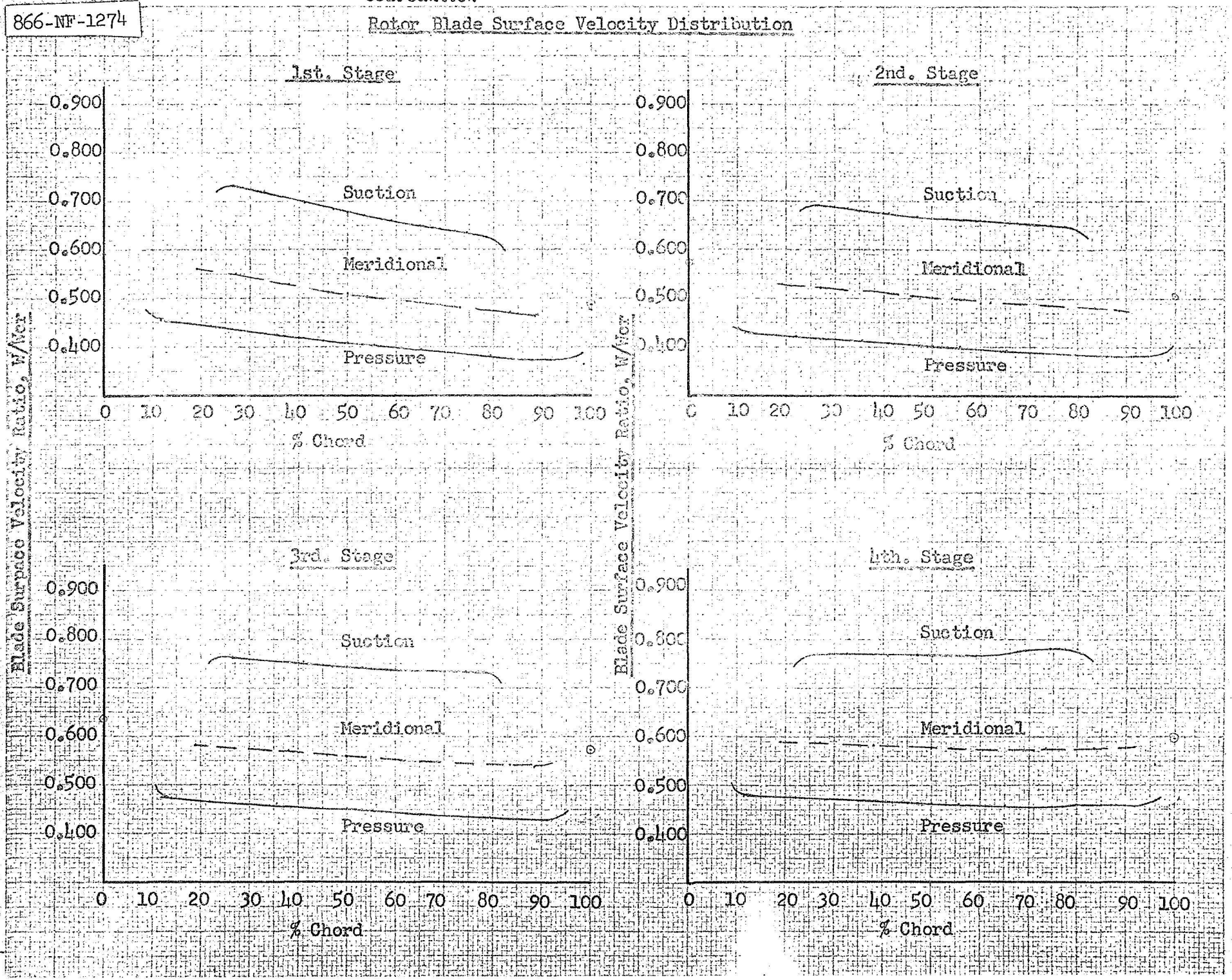
NOZZLE CHORDS: 3.00 ins
ROTOR CHORDS: 3.20 ins

Figure 3

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Rotor Blade Surface Velocity Distribution



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Rotor Passage Meridional Velocity Distributions

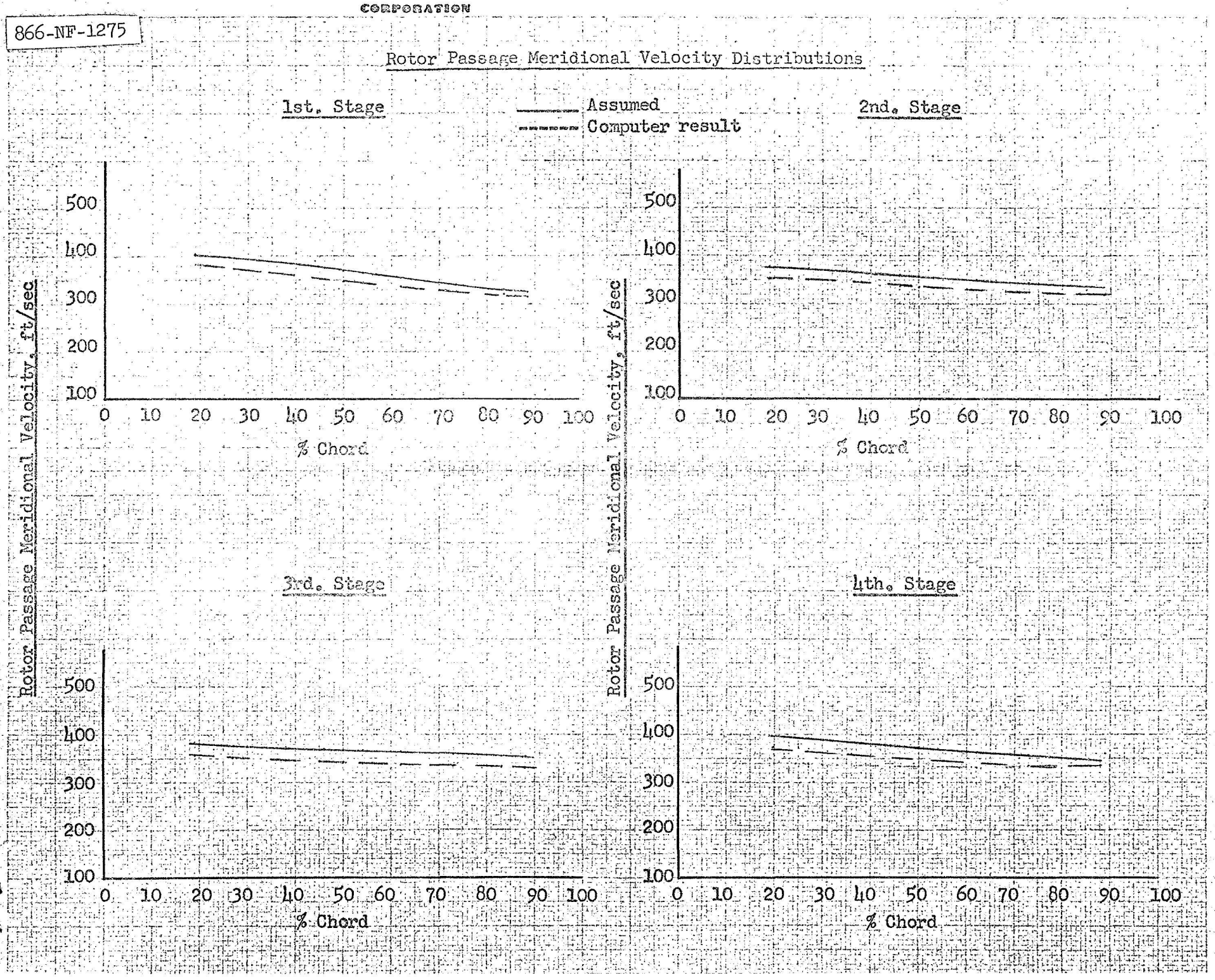
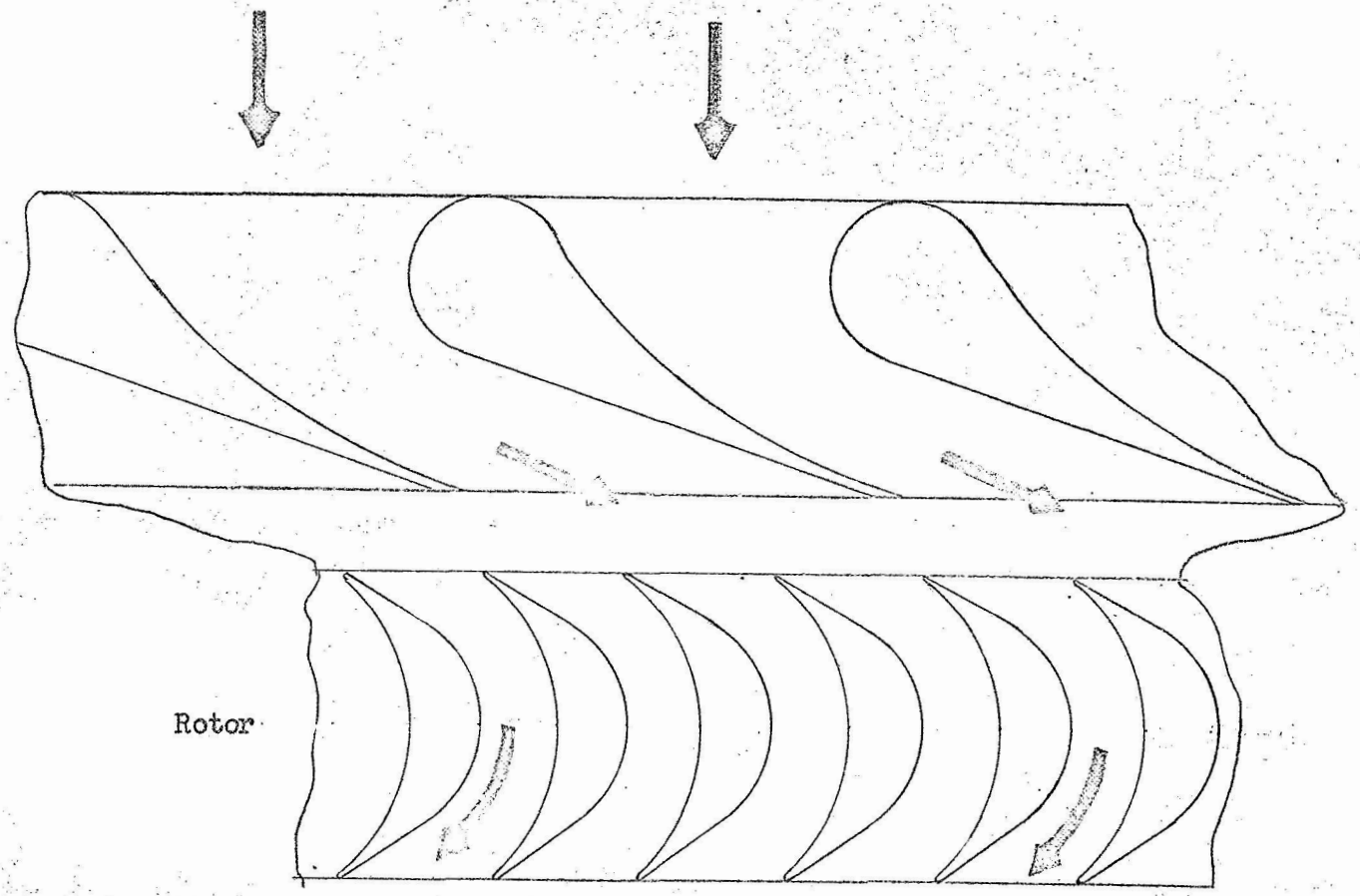


Fig 5

866-NF-1276



Typical Nozzle & Rotor Profiles

All Stages

Fig. 6

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FIRST STAGE WHEEL 101 BLADES VARIABLE PASSAGE WIDTH AND HEIGHT,

VELOCITY, AND DENSITY ITERATIVE METHOD 3.20 CHORD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 8.40000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.04000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.35770E 03	0.00000E-39	2.02700E-01
MEAN	6.33000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.35770E 03		
TIP	6.62000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.35770E 03	0.00000E-39	2.22300E-01

	BETA		
HUB	4.30000E 01	4.30000E 01	4.30000E 01
MEAN	4.30000E 01	4.30000E 01	4.30000E 01
TIP	4.30000E 01	4.30000E 01	4.30000E 01

ID1 = 0 ID2 = 0 X = 5.99000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 1 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.29123E 00 VSM = 1.30718E 00 VST = 1.32332E 00 VPH = 8.19895E-01

VPM = 8.12115E-01 VPT = 8.04408E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-2.29463E 00	1.71454E 03	-2.81092E-03
2	-2.26723E 00	1.71454E 03	-2.77735E-03
3	-2.24047E 00	1.71454E 03	-2.74458E-03
4	-2.21434E 00	1.71454E 03	-2.71256E-03
5	-2.18881E 00	1.71454E 03	-2.68129E-03
6	-2.16386E 00	1.71454E 03	-2.65073E-03
7	-2.13947E 00	1.71454E 03	-2.62086E-03
8	-2.11563E 00	1.71454E 03	-2.59165E-03
9	-2.09232E 00	1.71454E 03	-2.56309E-03

IK	M(IK)	N(IK)
1	2.19612E-02	1.67730E 03
2	1.63729E-02	1.68670E 03

```
3      1.08510E-02          1.69604E 03
4      5.39385E-03          1.70532E 03
5      0.00000E-39          1.71454E 03
6     -5.33202E-03          1.72371E 03
7     -1.06036E-02          1.73282E 03
8     -1.58161E-02          1.74188E 03
9     -2.09708E-02          1.75088E 03

 PH = -1.66208E 01   PM =  0.00000E-39   PT =  1.69813E 01

QH =  1.02220E 00   QM =  1.00000E 00   QT =  9.79248E-01


WSH =  8.22746E-01  WMH =  6.37178E-01  WPH =  5.22419E-01
WSM =  7.82999E-01  WMM =  5.99000E-01  WPM =  4.86457E-01
WST =  7.43996E-01  WMT =  5.62220E-01  WPT =  4.52254E-01

  A(IK)

6.2302E-01 6.0393E-01 5.8355E-01 5.6293E-01 5.4268E-01 5.2313E-01 5.0443E-01 4.8668E-01 4.6988E-01
6.1008E-01 5.8771E-01 5.6474E-01 5.4209E-01 5.2025E-01 4.9945E-01 4.7979E-01 4.6130E-01 4.4394E-01
5.9505E-01 5.6970E-01 5.4446E-01 5.2007E-01 4.9692E-01 4.7514E-01 4.5476E-01 4.3574E-01 4.1802E-01

N = 1  X = WMM/WCR =  5.99000E-01  WT FLOW CALC =  8.79798E-02   D = -4.73780E-02


WSH =  7.56751E-01  WMH =  5.86068E-01  WPH =  4.80514E-01
WSM =  7.17641E-01  WMM =  5.49000E-01  WPM =  4.45851E-01
WST =  6.79203E-01  WMT =  5.13258E-01  WPT =  4.12869E-01

  A(IK)

6.0021E-01 5.7771E-01 5.5515E-01 5.3322E-01 5.1223E-01 4.9235E-01 4.7362E-01 4.5602E-01 4.3952E-01
5.8362E-01 5.5843E-01 5.3383E-01 5.1032E-01 4.8814E-01 4.6736E-01 4.4796E-01 4.2988E-01 4.1304E-01
5.6517E-01 5.3764E-01 5.1129E-01 4.8651E-01 4.6340E-01 4.4197E-01 4.2212E-01 4.0376E-01 3.8676E-01

N = 2  X = WMM/WCR =  5.49000E-01  WT FLOW CALC =  8.27583E-02   D =  1.47823E-02


WSH =  7.89748E-01  WMH =  6.11623E-01  WPH =  5.01467E-01
WSM =  7.50320E-01  WMM =  5.74000E-01  WPM =  4.66154E-01
WST =  7.11600E-01  WMT =  5.37739E-01  WPT =  4.32562E-01

  A(IK)
```

6.1245E-01 5.9151E-01 5.6993E-01 5.4856E-01 5.2787E-01 5.0809E-01 4.8933E-01 4.7162E-01 4.5493E-01
5.9764E-01 5.7371E-01 5.4982E-01 5.2665E-01 5.0457E-01 4.8372E-01 4.6415E-01 4.4582E-01 4.2869E-01
5.8086E-01 5.5427E-01 5.2837E-01 5.0370E-01 4.8050E-01 4.5884E-01 4.3868E-01 4.1996E-01 4.0257E-01

N = 3 X = WMM/WCR = 5.74000E-01 WT FLOW CALC = 8.54390E-02 D = -1.71311E-02

WSH = 7.71822E-01 WMH = 5.97740E-01 WPH = 4.90084E-01
WSM = 7.32566E-01 WMM = 5.60418E-01 WPM = 4.55124E-01
WST = 6.93999E-01 WMT = 5.24439E-01 WPT = 4.21863E-01

A(IK)

6.0601E-01 5.8418E-01 5.6204E-01 5.4034E-01 5.1948E-01 4.9963E-01 4.8087E-01 4.6321E-01 4.4662E-01
5.9021E-01 5.6557E-01 5.4126E-01 5.1789E-01 4.9573E-01 4.7491E-01 4.5542E-01 4.3722E-01 4.2024E-01
5.7252E-01 5.4538E-01 5.1921E-01 4.9446E-01 4.7130E-01 4.4974E-01 4.2975E-01 4.1121E-01 3.9403E-01

N = 4 X = WMM/WCR = 5.60418E-01 WT FLOW CALC = 8.39997E-02 D = 3.74764E-06

FIRST STAGE WHEEL 101 BLADES VARIABLE PASSAGE WIDTH AND HEIGHT,

VELOCITY, AND DENSITY ITERATIVE METHOD 3.20 CHORD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 8.40000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.12000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.34330E 03	0.00000E-39	2.02600E-01
MEAN	6.42000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.34330E 03		
TIP	6.72000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.34330E 03	0.00000E-39	2.22400E-01

	BETA		
HUB	3.00000E 01	3.00000E 01	3.00000E 01
MEAN	3.00000E 01	3.00000E 01	3.00000E 01
TIP	3.00000E 01	3.00000E 01	3.00000E 01

ID1 = 0 ID2 = 1 X = 5.81000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.29561E 00 VSM = 1.31217E 00 VST = 1.32893E 00 VPH = 8.17741E-01

VPM = 8.09715E-01 VPT = 8.01768E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-1.23396E 00	1.25700E 03	-1.52702E-03
2	-1.21907E 00	1.25700E 03	-1.50859E-03
3	-1.20453E 00	1.25700E 03	-1.49060E-03
4	-1.19033E 00	1.25700E 03	-1.47304E-03
5	-1.17647E 00	1.25700E 03	-1.45588E-03
6	-1.16293E 00	1.25700E 03	-1.43912E-03
7	-1.14969E 00	1.25700E 03	-1.42274E-03
8	-1.13675E 00	1.25700E 03	-1.40673E-03
9	-1.12410E 00	1.25700E 03	-1.39107E-03

IK	M(IK)	N(IK)
1	1.19274E-02	1.24210E 03
2	8.89176E-03	1.24587E 03

```
3      5.89256E-03          1.24961E 03
4      2.92892E-03          1.25332E 03
5      0.00000E-39          1.25700E 03
6     -2.89500E-03          1.26064E 03
7     -5.75686E-03          1.26426E 03
8     -8.58633E-03          1.26784E 03
9     -1.13841E-02          1.27139E 03

 PH = -1.23710E 01   PM =  0.00000E-39   PT =  1.25159E 01

QH =  1.01200E 00   QM =  1.00000E 00   QT =  9.88680E-01


WSH =  7.85534E-01  WMH =  6.06303E-01  WPH =  4.95799E-01
WSM =  7.62368E-01  WMM =  5.81000E-01  WPM =  4.70445E-01
WST =  7.39289E-01  WMT =  5.56304E-01  WPT =  4.46027E-01

  A(IK)

6.1098E-01 5.8952E-01 5.6748E-01 5.4572E-01 5.2468E-01 5.0461E-01 4.8560E-01 4.6767E-01 4.5081E-01
6.0241E-01 5.7868E-01 5.5473E-01 5.3138E-01 5.0904E-01 4.8789E-01 4.6801E-01 4.4938E-01 4.3195E-01
5.9308E-01 5.6713E-01 5.4137E-01 5.1654E-01 4.9302E-01 4.7092E-01 4.5029E-01 4.3106E-01 4.1317E-01

N = 1  X = WMM/WCR =  5.81000E-01  WT FLOW CALC =  8.73817E-02   D = -4.02584E-02


WSH =  7.19976E-01  WMH =  5.55703E-01  WPH =  4.54421E-01
WSM =  6.96760E-01  WMM =  5.31000E-01  WPM =  4.29959E-01
WST =  6.73595E-01  WMT =  5.06870E-01  WPT =  4.06392E-01

  A(IK)

5.8467E-01 5.6043E-01 5.3673E-01 5.1405E-01 4.9262E-01 4.7249E-01 4.5367E-01 4.3610E-01 4.1969E-01
5.7385E-01 5.4764E-01 5.2233E-01 4.9834E-01 4.7586E-01 4.5495E-01 4.3541E-01 4.1731E-01 4.0050E-01
5.6231E-01 5.3421E-01 5.0740E-01 4.8224E-01 4.5883E-01 4.3715E-01 4.1712E-01 3.9860E-01 3.8149E-01

N = 2  X = WMM/WCR =  5.31000E-01  WT FLOW CALC =  8.18892E-02   D =  2.51289E-02


WSH =  7.52755E-01  WMH =  5.81003E-01  WPH =  4.75110E-01
WSM =  7.29564E-01  WMM =  5.56000E-01  WPM =  4.50202E-01
WST =  7.06442E-01  WMT =  5.31587E-01  WPT =  4.26209E-01

  A(IK)
```

5.9862E-01 5.7563E-01 5.5265E-01 5.3034E-01 5.0904E-01 4.8888E-01 4.6992E-01 4.5213E-01 4.3547E-01
5.8891E-01 5.6379E-01 5.3905E-01 5.1529E-01 4.9281E-01 4.7171E-01 4.5198E-01 4.3357E-01 4.1642E-01
5.7846E-01 5.5129E-01 5.2489E-01 4.9980E-01 4.7627E-01 4.5433E-01 4.3395E-01 4.1504E-01 3.9751E-01

N = 3 X = WMM/WCR = 5.56000E-01 WT FLOW CALC = 8.47047E-02 D = -8.38970E-03

WSH = 7.44397E-01 WMH = 5.74552E-01 WPH = 4.69835E-01
WSM = 7.21200E-01 WMM = 5.49626E-01 WPM = 4.45040E-01
WST = 6.98067E-01 WMT = 5.25285E-01 WPT = 4.21157E-01

A(IK)

5.9521E-01 5.7188E-01 5.4869E-01 5.2627E-01 5.0492E-01 4.8477E-01 4.6583E-01 4.4809E-01 4.3149E-01
5.8522E-01 5.5979E-01 5.3488E-01 5.1105E-01 4.8856E-01 4.6748E-01 4.4780E-01 4.2947E-01 4.1240E-01
5.7448E-01 5.4705E-01 5.2052E-01 4.9540E-01 4.7189E-01 4.5000E-01 4.2970E-01 4.1089E-01 3.9346E-01

N = 4 X = WMM/WCR = 5.49626E-01 WT FLOW CALC = 8.39998E-02 D = 2.42889E-06

FIRST STAGE WHEEL 101 BLADES VARIABLE PASSAGE WIDTH AND HEIGHT,

VELOCITY, AND DENSITY ITERATIVE METHOD 3.20 CHORD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 8.40000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.23000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.32760E 03	0.00000E-39	2.02400E-01
MEAN	6.54000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.32760E 03		
TIP	6.85000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.32760E 03	0.00000E-39	2.22600E-01

	BETA		
HUB	1.50000E 01	1.50000E 01	1.50000E 01
MEAN	1.50000E 01	1.50000E 01	1.50000E 01
TIP	1.50000E 01	1.50000E 01	1.50000E 01

ID1 = 0 ID2 = 2 X = 5.62000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.30166E 00 VSM = 1.31885E 00 VST = 1.33626E 00 VPH = 8.14789E-01

VPM = 8.06527E-01 VPT = 7.98349E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.30965E-01	6.50671E 02	-4.17843E-04
2	-3.26887E-01	6.50671E 02	-4.12695E-04
3	-3.22908E-01	6.50671E 02	-4.07671E-04
4	-3.19025E-01	6.50671E 02	-4.02769E-04
5	-3.15234E-01	6.50671E 02	-3.97983E-04
6	-3.11533E-01	6.50671E 02	-3.93310E-04
7	-3.07917E-01	6.50671E 02	-3.88745E-04
8	-3.04384E-01	6.50671E 02	-3.84285E-04
9	-3.00931E-01	6.50671E 02	-3.79926E-04

IK	M(IK)	N(IK)
1	3.26210E-03	6.48552E 02
2	2.43156E-03	6.49091E 02

```
3      1.61119E-03          6.49623E 02
4      8.00752E-04          6.50150E 02
5      0.00000E-39          6.50671E 02
6     -7.91293E-04          6.51186E 02
7     -1.57335E-03          6.51696E 02
8     -2.34638E-03          6.52199E 02
9     -3.11059E-03          6.52698E 02

 PH = -6.56116E 00   PM =  0.00000E-39   PT =  6.58209E 00

QH =  1.00327E 00   QM =  1.00000E 00   QT =  9.96894E-01


WSH =  7.46468E-01  WMH =  5.73475E-01  WPH =  4.67261E-01
WSM =  7.41191E-01  WMM =  5.62000E-01  WPM =  4.53268E-01
WST =  7.35808E-01  WMT =  5.50646E-01  WPT =  4.39608E-01

  A(IK)

5.9607E-01 5.7238E-01 5.4879E-01 5.2597E-01 5.0423E-01 4.8371E-01 4.6445E-01 4.4641E-01 4.2954E-01
5.9388E-01 5.6873E-01 5.4375E-01 5.1965E-01 4.9677E-01 4.7526E-01 4.5512E-01 4.3632E-01 4.1880E-01
5.9160E-01 5.6498E-01 5.3861E-01 5.1324E-01 4.8924E-01 4.6675E-01 4.4578E-01 4.2627E-01 4.0814E-01

N = 1  X = WMM/WCR =  5.62000E-01  WT FLOW CALC =  8.77147E-02   D = -4.42231E-02


WSH =  6.81173E-01  WMH =  5.23312E-01  WPH =  4.26389E-01
WSM =  6.75249E-01  WMM =  5.12000E-01  WPM =  4.12942E-01
WST =  6.69202E-01  WMT =  5.00802E-01  WPT =  3.99814E-01

  A(IK)

5.6617E-01 5.4034E-01 5.1561E-01 4.9230E-01 4.7051E-01 4.5022E-01 4.3139E-01 4.1390E-01 3.9765E-01
5.6316E-01 5.3587E-01 5.0981E-01 4.8532E-01 4.6251E-01 4.4134E-01 4.2175E-01 4.0361E-01 3.8682E-01
5.6004E-01 5.3128E-01 5.0391E-01 4.7826E-01 4.5445E-01 4.3244E-01 4.1213E-01 3.9339E-01 3.7609E-01

N = 2  X = WMM/WCR =  5.12000E-01  WT FLOW CALC =  8.18657E-02   D =  2.54084E-02


WSH =  7.13820E-01  WMH =  5.48393E-01  WPH =  4.46825E-01
WSM =  7.08220E-01  WMM =  5.37000E-01  WPM =  4.33105E-01
WST =  7.02505E-01  WMT =  5.25724E-01  WPT =  4.19711E-01

  A(IK)
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5.8188E-01 5.5698E-01 5.3271E-01 5.0956E-01 4.8773E-01 4.6728E-01 4.4818E-01 4.3038E-01 4.1380E-01
5.7929E-01 5.5292E-01 5.2729E-01 5.0291E-01 4.8000E-01 4.5860E-01 4.3869E-01 4.2019E-01 4.0300E-01
5.7660E-01 5.4876E-01 5.2176E-01 4.9617E-01 4.7219E-01 4.4989E-01 4.2920E-01 4.1004E-01 3.9230E-01

N = 3  X = WMM/WCR =  5.37000E-01  WT FLOW CALC =  8.48596E-02   D = -1.02337E-02


WSH =  7.04290E-01  WMH =  5.41072E-01  WPH =  4.40859E-01
WSM =  6.98596E-01  WMM =  5.29702E-01  WPM =  4.27219E-01
WST =  6.92783E-01  WMT =  5.18449E-01  WPT =  4.13903E-01

  A(IK)

5.7745E-01 5.5225E-01 5.2782E-01 5.0461E-01 4.8278E-01 4.6236E-01 4.4333E-01 4.2562E-01 4.0912E-01
5.7474E-01 5.4807E-01 5.2229E-01 4.9786E-01 4.7496E-01 4.5362E-01 4.3379E-01 4.1539E-01 3.9832E-01
5.7193E-01 5.4379E-01 5.1665E-01 4.9103E-01 4.6708E-01 4.4485E-01 4.2426E-01 4.0522E-01 3.8760E-01

N = 4  X = WMM/WCR =  5.29702E-01  WT FLOW CALC =  8.39998E-02   D =  2.86102E-06
```

FIRST STAGE WHEEL 101 BLADES VARIABLE PASSAGE WIDTH AND HEIGHT,

VELOCITY, AND DENSITY ITERATIVE METHOD 3.20 CHORD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 8.40000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.35000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.31530E 03	0.00000E-39	2.02300E-01
MEAN	6.67000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.31530E 03		
TIP	6.99000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.31530E 03	0.00000E-39	2.22700E-01

	BETA		
HUB	5.00000E 00	5.00000E 00	5.00000E 00
MEAN	5.00000E 00	5.00000E 00	5.00000E 00
TIP	5.00000E 00	5.00000E 00	5.00000E 00

ID1 = 0 ID2 = 3 X = 5.49000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.30828E 00 VSM = 1.32612E 00 VST = 1.34420E 00 VPH = 8.11581E-01

VPM = 8.03087E-01 VPT = 7.94682E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.75488E-02	2.19110E 02	-4.78747E-05
2	-3.70814E-02	2.19110E 02	-4.72788E-05
3	-3.66255E-02	2.19110E 02	-4.66975E-05
4	-3.61806E-02	2.19110E 02	-4.61303E-05
5	-3.57465E-02	2.19110E 02	-4.55767E-05
6	-3.53226E-02	2.19110E 02	-4.50363E-05
7	-3.49086E-02	2.19110E 02	-4.45085E-05
8	-3.45043E-02	2.19110E 02	-4.39930E-05
9	-3.41092E-02	2.19110E 02	-4.34892E-05

IK	M(IK)	N(IK)
1	3.73664E-04	2.19028E 02
2	2.78511E-04	2.19048E 02

```
3      1.84535E-04          2.19069E 02
4      9.17070E-05          2.19089E 02
5      0.00000E-39          2.19110E 02
6     -9.06130E-05          2.19129E 02
7     -1.80158E-04          2.19149E 02
8     -2.68659E-04          2.19168E 02
9     -3.56142E-04          2.19188E 02

 PH = -2.23450E 00   PM =  0.00000E-39   PT =  2.23532E 00

QH =  1.00037E 00   QM =  1.00000E 00   QT =  9.99644E-01


WSH =  7.22799E-01  WMH =  5.52478E-01  WPH =  4.48381E-01
WSM =  7.28041E-01  WMM =  5.49000E-01  WPM =  4.40895E-01
WST =  7.33306E-01  WMT =  5.45533E-01  WPT =  4.33525E-01

  A(IK)

5.8593E-01 5.6085E-01 5.3626E-01 5.1271E-01 4.9047E-01 4.6961E-01 4.5011E-01 4.3194E-01 4.1501E-01
5.8825E-01 5.6205E-01 5.3625E-01 5.1151E-01 4.8814E-01 4.6625E-01 4.4582E-01 4.2682E-01 4.0915E-01
5.9053E-01 5.6324E-01 5.3623E-01 5.1030E-01 4.8580E-01 4.6288E-01 4.4154E-01 4.2173E-01 4.0334E-01

N = 1  X = WMM/WCR =  5.49000E-01  WT FLOW CALC =  8.80370E-02   D = -4.80593E-02


WSH =  6.57360E-01  WMH =  5.02460E-01  WPH =  4.07787E-01
WSM =  6.61735E-01  WMM =  4.99000E-01  WPM =  4.00741E-01
WST =  6.66119E-01  WMT =  4.95550E-01  WPT =  3.93805E-01

  A(IK)

5.5378E-01 5.2692E-01 5.0150E-01 4.7773E-01 4.5565E-01 4.3521E-01 4.1630E-01 3.9882E-01 3.8263E-01
5.5611E-01 5.2797E-01 5.0127E-01 4.7631E-01 4.5314E-01 4.3173E-01 4.1196E-01 3.9371E-01 3.7685E-01
5.5842E-01 5.2901E-01 5.0103E-01 4.7488E-01 4.5063E-01 4.2825E-01 4.0763E-01 3.8864E-01 3.7113E-01

N = 2  X = WMM/WCR =  4.99000E-01  WT FLOW CALC =  8.19302E-02   D =  2.46403E-02


WSH =  6.90080E-01  WMH =  5.27469E-01  WPH =  4.28084E-01
WSM =  6.94888E-01  WMM =  5.24000E-01  WPM =  4.20818E-01
WST =  6.99713E-01  WMT =  5.20541E-01  WPT =  4.13665E-01

  A(IK)
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```
5.7060E-01 5.4449E-01 5.1938E-01 4.9564E-01 4.7341E-01 4.5270E-01 4.3346E-01 4.1560E-01 3.9901E-01
5.7295E-01 5.4563E-01 5.1926E-01 4.9432E-01 4.7099E-01 4.4928E-01 4.2914E-01 4.1048E-01 3.9319E-01
5.7527E-01 5.4675E-01 5.1914E-01 4.9300E-01 4.6856E-01 4.4585E-01 4.2483E-01 4.0539E-01 3.8741E-01

N = 3  X = WMM/WCR =  5.24030E-01  WT FLOW CALC =  8.50533E-02   D = -1.25389E-02


WSH =  6.78880E-01  WMH =  5.18909E-01  WPH =  4.21136E-01
WSM =  6.83540E-01  WMM =  5.15443E-01  WPM =  4.13946E-01
WST =  6.88214E-01  WMT =  5.11987E-01  WPT =  4.06867E-01

  A(IK)

5.6501E-01 5.3861E-01 5.1337E-01 4.8960E-01 4.6741E-01 4.4678E-01 4.2765E-01 4.0990E-01 3.9344E-01
5.6736E-01 5.3972E-01 5.1322E-01 4.8825E-01 4.6496E-01 4.4334E-01 4.2331E-01 4.0479E-01 3.8764E-01
5.6968E-01 5.4082E-01 5.1306E-01 4.8689E-01 4.6250E-01 4.3989E-01 4.1899E-01 3.9970E-01 3.8188E-01

N = 4  X = WMM/WCR =  5.15443E-01  WT FLOW CALC =  8.39997E-02   D =  3.38256E-06
```

FIRST STAGE WHEEL 101 BLADES VARIABLE PASSAGE WIDTH AND HEIGHT,

VELOCITY, AND DENSITY ITERATIVE METHOD 3.20 CHORD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 8.40000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.39000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.30990E 03	0.00000E-39	2.02200E-01
MEAN	6.71000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.30990E 03		
TIP	7.03000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.30990E 03	0.00000E-39	2.22700E-01

	BETA		
HUB	0.00000E-39	0.00000E-39	0.00000E-39
MEAN	0.00000E-39	0.00000E-39	0.00000E-39
TIP	0.00000E-39	0.00000E-39	0.00000E-39

ID1 = 0 ID2 = 4 X = 5.42000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.31050E 00 VSM = 1.32837E 00 VST = 1.34648E 00 VPH = 8.10514E-01

VPM = 8.02032E-01 VPT = 7.93638E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-0.00000E-39	0.00000E-39	-0.00000E-39
2	-0.00000E-39	0.00000E-39	-0.00000E-39
3	-0.00000E-39	0.00000E-39	-0.00000E-39
4	-0.00000E-39	0.00000E-39	-0.00000E-39
5	-0.00000E-39	0.00000E-39	-0.00000E-39
6	-0.00000E-39	0.00000E-39	-0.00000E-39
7	-0.00000E-39	0.00000E-39	-0.00000E-39
8	-0.00000E-39	0.00000E-39	-0.00000E-39
9	-0.00000E-39	0.00000E-39	-0.00000E-39

IK	M(IK)	N(IK)
1	0.00000E-39	0.00000E-39
2	0.00000E-39	0.00000E-39

```
3      0.000000E-39          0.000000E-39
4      0.000000E-39          0.000000E-39
5      0.000000E-39          0.000000E-39
6     -0.000000E-39          0.000000E-39
7     -0.000000E-39          0.000000E-39
8     -0.000000E-39          0.000000E-39
9     -0.000000E-39          0.000000E-39

 PH = -0.000000E-39    PM =  0.000000E-39    PT =  0.000000E-39

QH =  1.000000E 00    QM =  1.000000E 00    QT =  1.000000E 00


WSH =  7.10292E-01  WMH =  5.420000E-01  WPH =  4.39299E-01
WSM =  7.19975E-01  WMM =  5.420000E-01  WPM =  4.34701E-01
WST =  7.29791E-01  WMT =  5.420000E-01  WPT =  4.30152E-01

  A(IK)

5.8025E-01 5.5458E-01 5.2959E-01 5.0580E-01 4.8341E-01 4.6247E-01 4.4295E-01 4.2479E-01 4.0790E-01
5.8467E-01 5.5801E-01 5.3188E-01 5.0692E-01 4.8341E-01 4.6142E-01 4.4096E-01 4.2193E-01 4.0427E-01
5.8901E-01 5.6141E-01 5.3416E-01 5.0804E-01 4.8341E-01 4.6038E-01 4.3896E-01 4.1909E-01 4.0066E-01

N = 1  X = WMM/WCR =  5.420000E-01  WT FLOW CALC =  8.78172E-02   D = -4.54425E-02


WSH =  6.44766E-01  WMH =  4.920000E-01  WPH =  3.98773E-01
WSM =  6.53557E-01  WMM =  4.920000E-01  WPM =  3.94600E-01
WST =  6.62467E-01  WMT =  4.920000E-01  WPT =  3.90470E-01

  A(IK)

5.4692E-01 5.1968E-01 4.9403E-01 4.7014E-01 4.4803E-01 4.2760E-01 4.0874E-01 3.9133E-01 3.7523E-01
5.5173E-01 5.2326E-01 4.9635E-01 4.7126E-01 4.4803E-01 4.2659E-01 4.0682E-01 3.8860E-01 3.7179E-01
5.5650E-01 5.2683E-01 4.9867E-01 4.7237E-01 4.4803E-01 4.2558E-01 4.0491E-01 3.8588E-01 3.6836E-01

N = 2  X = WMM/WCR =  4.920000E-01  WT FLOW CALC =  8.15936E-02   D =  2.86478E-02


WSH =  6.77529E-01  WMH =  5.170000E-01  WPH =  4.19036E-01
WSM =  6.86766E-01  WMM =  5.170000E-01  WPM =  4.14650E-01
WST =  6.96129E-01  WMT =  5.170000E-01  WPT =  4.10311E-01

  A(IK)
```

```
5.6432E-01 5.3772E-01 5.1230E-01 4.8838E-01 4.6606E-01 4.4532E-01 4.2610E-01 4.0827E-01 3.9175E-01
5.6896E-01 5.4125E-01 5.1461E-01 4.8950E-01 4.6606E-01 4.4429E-01 4.2413E-01 4.0548E-01 3.8821E-01
5.7355E-01 5.4475E-01 5.1692E-01 4.9062E-01 4.6606E-01 4.4326E-01 4.2218E-01 4.0269E-01 3.8468E-01

N = 3  X = WMM/WCR =  5.17000E-01  WT FLOW CALC =  8.47748E-02   D = -9.22409E-03


WSH =  6.69416E-01  WMH =  5.10809E-01  WPH =  4.14018E-01
WSM =  6.78543E-01  WMM =  5.10809E-01  WPM =  4.09685E-01
WST =  6.87794E-01  WMT =  5.10809E-01  WPT =  4.05398E-01

  A(IK)

5.6015E-01 5.3336E-01 5.0787E-01 4.8394E-01 4.6166E-01 4.4099E-01 4.2184E-01 4.0412E-01 3.8770E-01
5.6484E-01 5.3690E-01 5.1018E-01 4.8506E-01 4.6166E-01 4.3996E-01 4.1989E-01 4.0134E-01 3.8417E-01
5.6947E-01 5.4043E-01 5.1250E-01 4.8618E-01 4.6166E-01 4.3894E-01 4.1794E-01 3.9857E-01 3.8067E-01

N = 4  X = WMM/WCR =  5.10809E-01  WT FLOW CALC =  8.39998E-02   D =  2.63005E-06
```

FIRST STAGE WHEEL 101 BLADES VARIABLE PASSAGE WIDTH AND HEIGHT,

VELOCITY, AND DENSITY ITERATIVE METHOD 3.20 CHORD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 8.40000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.42000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.30170E 03	0.00000E-39	2.02200E-01
MEAN	6.75000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.30170E 03		
TIP	7.08000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.30170E 03	0.00000E-39	2.22900E-01

	BETA		
HUB	5.00000E 00	5.00000E 00	5.00000E 00
MEAN	5.00000E 00	5.00000E 00	5.00000E 00
TIP	5.00000E 00	5.00000E 00	5.00000E 00

ID1 = 0 ID2 = 5 X = 5.34000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.31217E 00 VSM = 1.33062E 00 VST = 1.34933E 00 VPH = 8.09715E-01

VPM = 8.00978E-01 VPT = 7.92334E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.75674E-02	2.19110E 02	-4.86028E-05
2	-3.70927E-02	2.19110E 02	-4.79887E-05
3	-3.66299E-02	2.19110E 02	-4.73899E-05
4	-3.61785E-02	2.19110E 02	-4.68059E-05
5	-3.57380E-02	2.19110E 02	-4.62361E-05
6	-3.53082E-02	2.19110E 02	-4.56800E-05
7	-3.48886E-02	2.19110E 02	-4.51371E-05
8	-3.44788E-02	2.19110E 02	-4.46070E-05
9	-3.40786E-02	2.19110E 02	-4.40892E-05

IK	M(IK)	N(IK)
1	3.79208E-04	2.19026E 02
2	2.82616E-04	2.19048E 02

```
3      1.87238E-04          2.19068E 02
4      9.30426E-05          2.19089E 02
5      0.00000E-39          2.19110E 02
6     -9.19161E-05          2.19130E 02
7     -1.82733E-04          2.19150E 02
8     -2.72477E-04          2.19169E 02
9     -3.61174E-04          2.19189E 02

 PH = -2.26736E 00   PM =  0.00000E-39   PT =  2.26820E 00

QH =  1.00038E 00   QM =  1.00000E 00   QT =  9.99639E-01


WSH =  7.05320E-01  WMH =  5.37524E-01  WPH =  4.35241E-01
WSM =  7.10550E-01  WMM =  5.34000E-01  WPM =  4.27722E-01
WST =  7.15802E-01  WMT =  5.30487E-01  WPT =  4.20323E-01

  A(IK)

5.7793E-01 5.5197E-01 5.2679E-01 5.0285E-01 4.8035E-01 4.5934E-01 4.3978E-01 4.2160E-01 4.0469E-01
5.8037E-01 5.5321E-01 5.2675E-01 5.0158E-01 4.7793E-01 4.5588E-01 4.3538E-01 4.1636E-01 3.9872E-01
5.8278E-01 5.5444E-01 5.2671E-01 5.0030E-01 4.7551E-01 4.5241E-01 4.3098E-01 4.1115E-01 3.9279E-01

N = 1  X = WMM/WCR =  5.34000E-01  WT FLOW CALC =  8.76743E-02   D = -4.37420E-02


WSH =  6.39687E-01  WMH =  4.87505E-01  WPH =  3.94740E-01
WSM =  6.44019E-01  WMM =  4.84000E-01  WPM =  3.87673E-01
WST =  6.48360E-01  WMT =  4.80505E-01  WPT =  3.80721E-01

  A(IK)

5.4409E-01 5.1665E-01 4.9086E-01 4.6689E-01 4.4471E-01 4.2426E-01 4.0539E-01 3.8798E-01 3.7190E-01
5.4650E-01 5.1770E-01 4.9059E-01 4.6539E-01 4.4212E-01 4.2068E-01 4.0094E-01 3.8278E-01 3.6603E-01
5.4890E-01 5.1874E-01 4.9031E-01 4.6389E-01 4.3951E-01 4.1710E-01 3.9652E-01 3.7761E-01 3.6022E-01

N = 2  X = WMM/WCR =  4.84000E-01  WT FLOW CALC =  8.13643E-02   D =  3.20915E-02


WSH =  6.72504E-01  WMH =  5.12514E-01  WPH =  4.14991E-01
WSM =  6.77285E-01  WMM =  5.09000E-01  WPM =  4.07698E-01
WST =  6.82081E-01  WMT =  5.05496E-01  WPT =  4.00522E-01

  A(IK)
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5.6175E-01 5.3490E-01 5.0931E-01 4.8527E-01 4.6287E-01 4.4209E-01 4.2283E-01 4.0500E-01 3.8848E-01
5.6420E-01 5.3606E-01 5.0917E-01 4.8389E-01 4.6036E-01 4.3856E-01 4.1840E-01 3.9977E-01 3.8255E-01
5.6662E-01 5.3721E-01 5.0901E-01 4.8250E-01 4.5785E-01 4.3503E-01 4.1399E-01 3.9458E-01 3.7667E-01

N = 3  X = WMM/WCR =  5.09000E-01  WT FLOW CALC =  8.45586E-02   D = -6.64973E-03


WSH =  6.66770E-01  WMH =  5.08145E-01  WPH =  4.11453E-01
WSM =  6.71473E-01  WMM =  5.04632E-01  WPM =  4.04199E-01
WST =  6.76190E-01  WMT =  5.01130E-01  WPT =  3.97062E-01

  A(IK)

5.5877E-01 5.3180E-01 5.0616E-01 4.8212E-01 4.5975E-01 4.3901E-01 4.1982E-01 4.0206E-01 3.8561E-01
5.6121E-01 5.3294E-01 5.0599E-01 4.8072E-01 4.5722E-01 4.3548E-01 4.1539E-01 3.9683E-01 3.7969E-01
5.6364E-01 5.3407E-01 5.0581E-01 4.7931E-01 4.5469E-01 4.3194E-01 4.1097E-01 3.9164E-01 3.7382E-01

N = 4  X = WMM/WCR =  5.04632E-01  WT FLOW CALC =  8.39998E-02   D =  1.92225E-06
```

FIRST STAGE WHEEL 101 BLADES VARIABLE PASSAGE WIDTH AND HEIGHT,

VELOCITY, AND DENSITY ITERATIVE METHOD 3.20 CHORD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 8.40000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.54000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.29010E 03	0.00000E-39	2.02100E-01
MEAN	6.88000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.29010E 03		
TIP	7.22000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.29010E 03	0.00000E-39	2.22900E-01

	BETA		
HUB	1.50000E 01	1.50000E 01	1.50000E 01
MEAN	1.50000E 01	1.50000E 01	1.50000E 01
TIP	1.50000E 01	1.50000E 01	1.50000E 01

ID1 = 0 ID2 = 6 X = 5.20000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.31885E 00 VSM = 1.33796E 00 VST = 1.35735E 00 VPH = 8.06527E-01

VPM = 7.97562E-01 VPT = 7.88606E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.31456E-01	6.50671E 02	-4.30893E-04
2	-3.27246E-01	6.50671E 02	-4.25420E-04
3	-3.23142E-01	6.50671E 02	-4.20084E-04
4	-3.19139E-01	6.50671E 02	-4.14881E-04
5	-3.15234E-01	6.50671E 02	-4.09805E-04
6	-3.11424E-01	6.50671E 02	-4.04851E-04
7	-3.07705E-01	6.50671E 02	-4.00016E-04
8	-3.04073E-01	6.50671E 02	-3.95295E-04
9	-3.00526E-01	6.50671E 02	-3.90684E-04

IK	M(IK)	N(IK)
1	3.36147E-03	6.48487E 02
2	2.50515E-03	6.49043E 02

```
3       1.       E-03          6.49592E 02
4       [illegible]5E-04       6.50135E 02
5       0.       0E-39         6.50671E 02
6      -2.14056E-04           6.51201E 02
7      -1.61952E-03           6.51726E 02
8      -2.41483E-03           6.52244E 02
9      -3.20081E-03           6.52757E 02

 PH = -6.75571E 00   PM =  0.00000E-39   PT =  6.77791E 00

QH =  1.00337E 00   QM =  1.00000E 00   QT =  9.96804E-01


WSH =  7.01199E-01  WMH =  5.31676E-01  WPH =  4.28811E-01
WSM =  6.95739E-01  WMM =  5.20000E-01  WPM =  4.14732E-01
WST =  6.90137E-01  WMT =  5.08445E-01  WPT =  4.01009E-01

  A(IK)

5.7598E-01 5.4939E-01 5.2365E-01 4.9924E-01 4.7633E-01 4.5497E-01 4.3512E-01 4.1669E-01 3.9959E-01
5.7336E-01 5.4518E-01 5.1797E-01 4.9223E-01 4.6818E-01 4.4583E-01 4.2514E-01 4.0599E-01 3.8827E-01
5.7063E-01 5.4085E-01 5.1216E-01 4.8514E-01 4.5997E-01 4.3667E-01 4.1517E-01 3.9535E-01 3.7707E-01

N = 1  X = WMM/WCR =  5.20000E-01  WT FLOW CALC =  8.72382E-02   D = -3.85497E-02


WSH =  6.35035E-01  WMH =  4.81508E-01  WPH =  3.88349E-01
WSM =  6.28841E-01  WMM =  4.70000E-01  WPM =  3.74854E-01
WST =  6.22487E-01  WMT =  4.58605E-01  WPT =  3.61700E-01

  A(IK)

5.4147E-01 5.1345E-01 4.8716E-01 4.6278E-01 4.4026E-01 4.1952E-01 4.0042E-01 3.8283E-01 3.6660E-01
5.3794E-01 5.0837E-01 4.8071E-01 4.5514E-01 4.3161E-01 4.1002E-01 3.9021E-01 3.7201E-01 3.5528E-01
5.3427E-01 5.0315E-01 4.7414E-01 4.4741E-01 4.2292E-01 4.0052E-01 3.8003E-01 3.6129E-01 3.4410E-01

N = 2  X = WMM/WCR =  4.70000E-01  WT FLOW CALC =  8.06217E-02   D =  4.02180E-02


WSH =  6.68117E-01  WMH =  5.06592E-01  WPH =  4.08580E-01
WSM =  6.62290E-01  WMM =  4.95000E-01  WPM =  3.94793E-01
WST =  6.56312E-01  WMT =  4.83525E-01  WPT =  3.81354E-01

  A(IK)
```

5.5947E-01 5.3202E-01 5.0590E-01 4.8141E-01 4.5863E-01 4.3753E-01 4.1802E-01 3.9997E-01 3.8327E-01
5.5641E-01 5.2738E-01 4.9983E-01 4.7408E-01 4.5023E-01 4.2820E-01 4.0790E-01 3.8920E-01 3.7195E-01
5.5322E-01 5.2260E-01 4.9364E-01 4.6667E-01 4.4176E-01 4.1886E-01 3.9782E-01 3.7851E-01 3.6075E-01

N = 3 X = WMM/WCR = 4.95000E-01 WT FLOW CALC = 8.39988E-02 D = 1.39773E-05

FIRST STAGE WHEEL 101 BLADES VARIABLE PASSAGE WIDTH AND HEIGHT,

VELOCITY, AND DENSITY ITERATIVE METHOD 3.20 CHORD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 8.40000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.65000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.27300E 03	0.00000E-39	2.01900E-01
MEAN	7.00000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.27300E 03		
TIP	7.35000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.27300E 03	0.00000E-39	2.23100E-01

	BETA		
HUB	3.00000E 01	3.00000E 01	3.00000E 01
MEAN	3.00000E 01	3.00000E 01	3.00000E 01
TIP	3.00000E 01	3.00000E 01	3.00000E 01

ID1 = 0 ID2 = 7 X = 4.99000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.32500E 00 VSM = 1.34477E 00 VST = 1.36484E 00 VPH = 8.03615E-01

VPM = 7.94421E-01 VPT = 7.85332E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-1.23824E 00	1.25700E 03	-1.64066E-03
2	-1.22219E 00	1.25700E 03	-1.61941E-03
3	-1.20656E 00	1.25700E 03	-1.59870E-03
4	-1.19133E 00	1.25700E 03	-1.57851E-03
5	-1.17647E 00	1.25700E 03	-1.55882E-03
6	-1.16198E 00	1.25700E 03	-1.53962E-03
7	-1.14784E 00	1.25700E 03	-1.52089E-03
8	-1.13404E 00	1.25700E 03	-1.50261E-03
9	-1.12057E 00	1.25700E 03	-1.48476E-03

IK	M(IK)	N(IK)
1	1.27927E-02	1.24102E 03
2	9.53264E-03	1.24507E 03

```
3      6.31454E-03          1.24909E 03
4      3.13733E-03          1.25306E 03
5      0.00000E-39          1.25700E 03
6     -3.09845E-03          1.26090E 03
7     -6.15896E-03          1.26477E 03
8     -9.18246E-03          1.26860E 03
9     -1.21698E-02          1.27239E 03

 PH = -1.32401E 01   PM =  0.00000E-39   PT =  1.34063E 01

QH =  1.01287E 00   QM =  1.00000E 00   QT =  9.87904E-01


WSH =  6.95706E-01  WMH =  5.25061E-01  WPH =  4.21947E-01
WSM =  6.71040E-01  WMM =  4.99000E-01  WPM =  3.96416E-01
WST =  6.46347E-01  WMT =  4.73571E-01  WPT =  3.71911E-01

  A(IK)

5.7335E-01 5.4613E-01 5.1986E-01 4.9500E-01 4.7173E-01 4.5008E-01 4.2998E-01 4.1136E-01 3.9410E-01
5.6099E-01 5.3164E-01 5.0366E-01 4.7746E-01 4.5314E-01 4.3068E-01 4.0997E-01 3.9089E-01 3.7329E-01
5.4779E-01 5.1643E-01 4.8691E-01 4.5952E-01 4.3431E-01 4.1119E-01 3.9001E-01 3.7060E-01 3.5279E-01

N = 1  X = WMM/WCR =  4.99000E-01  WT FLOW CALC =  8.64712E-02   D = -2.94185E-02


WSH =  6.28603E-01  WMH =  4.74418E-01  WPH =  3.81249E-01
WSM =  6.03802E-01  WMM =  4.49000E-01  WPM =  3.56695E-01
WST =  5.78930E-01  WMT =  4.24176E-01  WPT =  3.33119E-01

  A(IK)

5.3781E-01 5.0922E-01 4.8249E-01 4.5775E-01 4.3495E-01 4.1399E-01 3.9472E-01 3.7699E-01 3.6066E-01
5.2317E-01 4.9286E-01 4.6480E-01 4.3904E-01 4.1549E-01 3.9397E-01 3.7431E-01 3.5631E-01 3.3981E-01
5.0772E-01 4.7584E-01 4.4662E-01 4.2003E-01 3.9588E-01 3.7396E-01 3.5405E-01 3.3591E-01 3.1935E-01

N = 2  X = WMM/WCR =  4.49000E-01  WT FLOW CALC =  7.94740E-02   D =  5.38815E-02


WSH =  6.62154E-01  WMH =  4.99739E-01  WPH =  4.01598E-01
WSM =  6.37421E-01  WMM =  4.74000E-01  WPM =  3.76556E-01
WST =  6.12639E-01  WMT =  4.48873E-01  WPT =  3.52515E-01

  A(IK)
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5.5633E-01 5.2829E-01 5.0167E-01 4.7678E-01 4.5368E-01 4.3232E-01 4.1259E-01 3.9438E-01 3.7756E-01
5.4282E-01 5.1283E-01 4.8470E-01 4.5864E-01 4.3463E-01 4.1259E-01 3.9236E-01 3.7379E-01 3.5671E-01
5.2848E-01 4.9670E-01 4.6721E-01 4.4014E-01 4.1539E-01 3.9282E-01 3.7223E-01 3.5342E-01 3.3622E-01

N = 3 X = WMM/WCR = 4.74000E-01 WT FLOW CALC = 8.30407E-02 D = 1.14203E-02

WSH = 6.71404E-01 WMH = 5.06720E-01 WPH = 4.07208E-01
WSM = 6.46689E-01 WMM = 4.80892E-01 WPM = 3.82031E-01
WST = 6.21931E-01 WMT = 4.55682E-01 WPT = 3.57862E-01

A(IK)

5.6118E-01 5.3333E-01 5.0679E-01 4.8189E-01 4.5873E-01 4.3727E-01 4.1744E-01 3.9911E-01 3.8215E-01
5.4798E-01 5.1814E-01 4.9003E-01 4.6398E-01 4.3980E-01 4.1763E-01 3.9726E-01 3.7854E-01 3.6132E-01
5.3395E-01 5.0225E-01 4.7273E-01 4.4555E-01 4.2067E-01 3.9793E-01 3.7717E-01 3.5819E-01 3.4082E-01

N = 4 X = WMM/WCR = 4.80892E-01 WT FLOW CALC = 8.40003E-02 D = -3.14415E-06

FIRST STAGE WHEEL 101 BLADES VARIABLE PASSAGE WIDTH AND HEIGHT,

VELOCITY, AND DENSITY ITERATIVE METHOD 3.20 CHORD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 8.40000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.77000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.25800E 03	0.00000E-39	2.01800E-01
MEAN	7.13000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.25800E 03		
TIP	7.49000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.25800E 03	0.00000E-39	2.23200E-01

	BETA		
HUB	4.50000E 01	4.50000E 01	4.50000E 01
MEAN	4.50000E 01	4.50000E 01	4.50000E 01
TIP	4.50000E 01	4.50000E 01	4.50000E 01

ID1 = 0 ID2 = 8 X = 4.85000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.33175E 00 VSM = 1.35219E 00 VST = 1.37295E 00 VPH = 8.00451E-01

VPM = 7.91033E-01 VPT = 7.81726E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-2.47770E 00	1.77767E 03	-3.31392E-03
2	-2.44529E 00	1.77767E 03	-3.27057E-03
3	-2.41371E 00	1.77767E 03	-3.22834E-03
4	-2.38294E 00	1.77767E 03	-3.18718E-03
5	-2.35294E 00	1.77767E 03	-3.14706E-03
6	-2.32369E 00	1.77767E 03	-3.10793E-03
7	-2.29516E 00	1.77767E 03	-3.06977E-03
8	-2.26732E 00	1.77767E 03	-3.03254E-03
9	-2.24014E 00	1.77767E 03	-2.99619E-03

IK	M(IK)	N(IK)
1	2.58332E-02	1.73233E 03
2	1.92487E-02	1.74378E 03

```
3      1.27498E-02          1.75515E 03
4      6.33424E-03          1.76644E 03
5      0.00000E-39          1.77767E 03
6     -6.25499E-03          1.78882E 03
7     -1.24327E-02          1.79991E 03
8     -1.85350E-02          1.81092E 03
9     -2.45637E-02          1.82187E 03

 PH = -1.87795E 01   PM =  0.00000E-39   PT =  1.92585E 01

QH =  1.02617E 00   QM =  1.00000E 00   QT =  9.75736E-01

WSH =  7.00379E-01  WMH =  5.25910E-01  WPH =  4.20966E-01
WSM =  6.55812E-01  WMM =  4.85000E-01  WPM =  3.83651E-01
WST =  6.11944E-01  WMT =  4.45716E-01  WPT =  3.48428E-01

  A(IK)

5.7559E-01 5.4802E-01 5.2132E-01 4.9602E-01 4.7232E-01 4.5027E-01 4.2982E-01 4.1086E-01 3.9331E-01
5.5295E-01 5.2271E-01 4.9411E-01 4.6747E-01 4.4286E-01 4.2021E-01 3.9940E-01 3.8027E-01 3.6267E-01
5.2806E-01 4.9567E-01 4.6564E-01 4.3808E-01 4.1293E-01 3.9002E-01 3.6914E-01 3.5009E-01 3.3269E-01

N = 1  X = WMM/WCR =  4.85000E-01  WT FLOW CALC =  8.59010E-02   D = -2.26306E-02

WSH =  6.32049E-01  WMH =  4.74602E-01  WPH =  3.79896E-01
WSM =  5.88202E-01  WMM =  4.35000E-01  WPM =  3.44099E-01
WST =  5.44963E-01  WMT =  3.96929E-01  WPT =  3.10290E-01

  A(IK)

5.3978E-01 5.1072E-01 4.8350E-01 4.5830E-01 4.3509E-01 4.1375E-01 3.9414E-01 3.7612E-01 3.5952E-01
5.1357E-01 4.8264E-01 4.5418E-01 4.2819E-01 4.0450E-01 3.8294E-01 3.6329E-01 3.4535E-01 3.2894E-01
4.8542E-01 4.5314E-01 4.2390E-01 3.9751E-01 3.7371E-01 3.5223E-01 3.3280E-01 3.1518E-01 2.9916E-01

N = 2  X = WMM/WCR =  4.35000E-01  WT FLOW CALC =  7.86474E-02   D =  6.37211E-02

WSH =  6.66214E-01  WMH =  5.00256E-01  WPH =  4.00431E-01
WSM =  6.22007E-01  WMM =  4.60000E-01  WPM =  3.63875E-01
WST =  5.78453E-01  WMT =  4.21323E-01  WPT =  3.29359E-01

  A(IK)
```

5.5847E-01 5.3000E-01 5.0292E-01 4.7758E-01 4.5406E-01 4.3231E-01 4.1223E-01 3.9370E-01 3.7660E-01
5.3399E-01 5.0325E-01 4.7461E-01 4.4820E-01 4.2399E-01 4.0183E-01 3.8156E-01 3.6299E-01 3.4596E-01
5.0742E-01 4.7493E-01 4.4518E-01 4.1813E-01 3.9359E-01 3.7135E-01 3.5116E-01 3.3279E-01 3.1605E-01

N = 3 X = WMM/WCR = 4.60000E-01 WT FLOW CALC = 8.23420E-02 D = 1.97387E-02

WSH = 6.81969E-01 WMH = 5.12086E-01 WPH = 4.09900E-01
WSM = 6.37596E-01 WMM = 4.71529E-01 WPM = 3.72995E-01
WST = 5.93897E-01 WMT = 4.32572E-01 WPT = 3.38152E-01

A(IK)

5.6657E-01 5.3847E-01 5.1154E-01 4.8619E-01 4.6257E-01 4.4067E-01 4.2040E-01 4.0167E-01 3.8435E-01
5.4292E-01 5.1237E-01 4.8372E-01 4.5718E-01 4.3277E-01 4.1037E-01 3.8984E-01 3.7100E-01 3.5371E-01
5.1711E-01 4.8463E-01 4.5472E-01 4.2741E-01 4.0258E-01 3.8001E-01 3.5950E-01 3.4081E-01 3.2376E-01

N = 4 X = WMM/WCR = 4.71529E-01 WT FLOW CALC = 8.40004E-02 D = -4.63426E-06

FIRST STAGE WHEEL 101 BLADES VARIABLE PASSAGE WIDTH AND HEIGHT,

VELOCITY, AND DENSITY ITERATIVE METHOD 3.20 CHORD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 8.40000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.84000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.25040E 03	0.00000E-39	2.01700E-01
MEAN	7.21000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.25040E 03		
TIP	7.58000E-03	9.79600E 01	5.89700E 01	6.82930E 02	1.25040E 03	0.00000E-39	2.23300E-01

	BETA		
HUB	5.50000E 01	5.50000E 01	5.50000E 01
MEAN	5.50000E 01	5.50000E 01	5.50000E 01
TIP	5.50000E 01	5.50000E 01	5.50000E 01

ID1 = 0 ID2 = 9 X = 4.79000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.33570E 00 VSM = 1.35677E 00 VST = 1.37819E 00 VPH = 7.98611E-01

VPM = 7.88955E-01 VPT = 7.79416E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.32677E 00	2.05935E 03	-4.49114E-03
2	-3.28283E 00	2.05935E 03	-4.43182E-03
3	-3.24003E 00	2.05935E 03	-4.37404E-03
4	-3.19833E 00	2.05935E 03	-4.31775E-03
5	-3.15769E 00	2.05935E 03	-4.26289E-03
6	-3.11808E 00	2.05935E 03	-4.20940E-03
7	-3.07944E 00	2.05935E 03	-4.15724E-03
8	-3.04175E 00	2.05935E 03	-4.10636E-03
9	-3.00497E 00	2.05935E 03	-4.05671E-03

IK	M(IK)	N(IK)
1	3.50012E-02	1.98852E 03
2	2.60783E-02	2.00634E 03

```
3      1.72724E-02          2.02408E 03
4      8.58063E-03          2.04175E 03
5      0.00000E-39          2.05935E 03
6     -8.47229E-03          2.07687E 03
7     -1.68389E-02          2.09432E 03
8     -2.51025E-02          2.11170E 03
9     -3.32656E-02          2.12901E 03

 PH = -2.18596E 01   PM =  0.00000E-39   PT =  2.26181E 01

QH =  1.03562E 00   QM =  1.00000E 00   QT =  9.67282E-01


WSH =  7.06865E-01  WMH =  5.29211E-01  WPH =  4.22634E-01
WSM =  6.49895E-01  WMM =  4.79000E-01  WPM =  3.77910E-01
WST =  5.94401E-01  WMT =  4.31292E-01  WPT =  3.36156E-01

  A(IK)

5.7866E-01 5.5100E-01 5.2411E-01 4.9857E-01 4.7462E-01 4.5231E-01 4.3161E-01 4.1242E-01 3.9465E-01
5.4974E-01 5.1905E-01 4.9009E-01 4.6319E-01 4.3839E-01 4.1560E-01 3.9468E-01 3.7549E-01 3.5785E-01
5.1742E-01 4.8455E-01 4.5429E-01 4.2667E-01 4.0156E-01 3.7877E-01 3.5805E-01 3.3920E-01 3.2201E-01

N = 1  X = WMM/WCR =  4.79000E-01  WT FLOW CALC =  8.62749E-02   D = -2.70818E-02


WSH =  6.37701E-01  WMH =  4.77430E-01  WPH =  3.81281E-01
WSM =  5.82056E-01  WMM =  4.29000E-01  WPM =  3.38462E-01
WST =  5.27746E-01  WMT =  3.82928E-01  WPT =  2.98460E-01

  A(IK)

5.4298E-01 5.1369E-01 4.8620E-01 4.6071E-01 4.3721E-01 4.1560E-01 3.9575E-01 3.7749E-01 3.6069E-01
5.0970E-01 4.7843E-01 4.4972E-01 4.2354E-01 3.9974E-01 3.7810E-01 3.5840E-01 3.4044E-01 3.2403E-01
4.7360E-01 4.4116E-01 4.1193E-01 3.8567E-01 3.6207E-01 3.4082E-01 3.2165E-01 3.0430E-01 2.8855E-01

N = 2  X = WMM/WCR =  4.29000E-01  WT FLOW CALC =  7.88578E-02   D =  6.12163E-02


WSH =  6.72283E-01  WMH =  5.03321E-01  WPH =  4.01957E-01
WSM =  6.15975E-01  WMM =  4.54000E-01  WPM =  3.58186E-01
WST =  5.61073E-01  WMT =  4.07110E-01  WPT =  3.17308E-01

  A(IK)
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```
5.6163E-01 5.3299E-01 5.0568E-01 4.8007E-01 4.5628E-01 4.3426E-01 4.1393E-01 3.9517E-01 3.7785E-01
5.3045E-01 4.9931E-01 4.7037E-01 4.4374E-01 4.1937E-01 3.9710E-01 3.7675E-01 3.5814E-01 3.4109E-01
4.9617E-01 4.6336E-01 4.3351E-01 4.0649E-01 3.8207E-01 3.6001E-01 3.4003E-01 3.2190E-01 3.0540E-01

N = 3  X = WMM/WCR =  4.54000E-01  WT FLOW CALC =  8.26345E-02   D =  1.62557E-02


WSH =  6.85104E-01  WMH =  5.12919E-01  WPH =  4.09623E-01
WSM =  6.28550E-01  WMM =  4.63268E-01  WPM =  3.65498E-01
WST =  5.73429E-01  WMT =  4.16075E-01  WPT =  3.24296E-01

  A(IK)

5.6814E-01 5.3982E-01 5.1264E-01 4.8704E-01 4.6316E-01 4.4102E-01 4.2055E-01 4.0162E-01 3.8412E-01
5.3778E-01 5.0677E-01 4.7779E-01 4.5104E-01 4.2649E-01 4.0402E-01 3.8345E-01 3.6462E-01 3.4734E-01
5.0420E-01 4.7134E-01 4.4131E-01 4.1405E-01 3.8936E-01 3.6701E-01 3.4675E-01 3.2835E-01 3.1159E-01

N = 4  X = WMM/WCR =  4.63268E-01  WT FLOW CALC =  8.40003E-02   D = -4.15742E-06
```

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END-OF-FILE READING ON SYSTEM INPUT TAPE.
RETURNING TO SYSTEM.
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01958 LINES OUTPUT.

ELAPSED TIME THIS JOB--000.57 MINUTES.

SECOND STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 6.51000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	5.93000E-03	9.79600E 01	5.89700E 01	6.68750E 02	8.08520E 02	0.00000E-39	1.99200E-01
MEAN	6.33000E-03	9.79600E 01	5.89700E 01	6.68750E 02	8.08520E 02		
TIP	6.73000E-03	9.79600E 01	5.89700E 01	6.68750E 02	8.08520E 02	0.00000E-39	2.25800E-01

	BETA		
HUB	4.30000E 01	4.30000E 01	4.30000E 01
MEAN	4.30000E 01	4.30000E 01	4.30000E 01
TIP	4.30000E 01	4.30000E 01	4.30000E 01

ID1 = 0 ID2 = 0 X = 5.65000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 1 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.28524E 00 VSM = 1.30718E 00 VST = 1.32949E 00 VPH = 8.22865E-01

VPM = 8.12115E-01 VPT = 8.01505E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-2.33495E 00	1.71454E 03	-3.88185E-03
2	-2.28461E 00	1.71454E 03	-3.81812E-03
3	-2.23952E 00	1.71454E 03	-3.75645E-03
4	-2.22360E 00	1.71454E 03	-3.69674E-03
5	-2.18881E 00	1.71454E 03	-3.63889E-03
6	-2.15509E 00	1.71454E 03	-3.58283E-03
7	-2.12239E 00	1.71454E 03	-3.52847E-03
8	-2.09067E 00	1.71454E 03	-3.47574E-03
9	-2.05988E 00	1.71454E 03	-3.42456E-03

IK	M(IK)	N(IK)
1	3.00634E-02	1.66377E 03
2	2.23634E-02	1.67663E 03

```
3      1.47888E-02          1.68937E 03
4      7.33563E-03          1.70201E 03
5      0.00000E-39          1.71454E 03
6     -7.22172E-03          1.72697E 03
7     -1.43330E-02          1.73930E 03
8     -2.13372E-02          1.75152E 03
9     -2.82375E-02          1.76365E 03

 PH = -2.24677E 01   PM =  0.00000E-39   PT =  2.31317E 01

QH =  1.03052E 00   QM =  1.00000E 00   QT =  9.72157E-01


WSH =  7.92819E-01  WMH =  6.16866E-01  WPH =  5.07597E-01
WSM =  7.38555E-01  WMM =  5.65000E-01  WPM =  4.58845E-01
WST =  6.85543E-01  WMT =  5.15642E-01  WPT =  4.13290E-01

  A(IK)

6.1350E-01 5.9312E-01 5.7209E-01 5.5122E-01 5.3098E-01 5.1160E-01 4.9318E-01 4.7577E-01 4.5936E-01
5.9277E-01 5.6836E-01 5.4418E-01 5.2097E-01 4.9874E-01 4.7790E-01 4.5838E-01 4.4014E-01 4.2310E-01
5.6836E-01 5.4052E-01 5.1379E-01 4.8830E-01 4.6510E-01 4.4328E-01 4.2308E-01 4.0440E-01 3.8710E-01

N = 1  X = WMM/WCR =  5.65000E-01  WT FLOW CALC =  6.82240E-02   D = -4.79876E-02


WSH =  7.26596E-01  WMH =  5.65340E-01  WPH =  4.65198E-01
WSM =  6.73197E-01  WMM =  5.15000E-01  WPM =  4.18239E-01
WST =  6.20919E-01  WMT =  4.67035E-01  WPT =  3.74330E-01

  A(IK)

5.8761E-01 5.6437E-01 5.4158E-01 5.1970E-01 4.9896E-01 4.7944E-01 4.6113E-01 4.4399E-01 4.2797E-01
5.6210E-01 5.3566E-01 5.1044E-01 4.8674E-01 4.6464E-01 4.4412E-01 4.2509E-01 4.0746E-01 3.9111E-01
5.3336E-01 5.0434E-01 4.7730E-01 4.5232E-01 4.2936E-01 4.0829E-01 3.8895E-01 3.7118E-01 3.5484E-01

N = 2  X = WMM/WCR =  5.15000E-01  WT FLOW CALC =  6.37055E-02   D =  2.14208E-02


WSH =  7.59707E-01  WMH =  5.91103E-01  WPH =  4.86398E-01
WSM =  7.05876E-01  WMM =  5.40000E-01  WPM =  4.38542E-01
WST =  6.53231E-01  WMT =  4.91339E-01  WPT =  3.93810E-01

  A(IK)
```

6.0138E-01 5.7942E-01 5.5740E-01 5.3594E-01 5.1538E-01 4.9587E-01 4.7746E-01 4.6015E-01 4.4389E-01
5.7819E-01 5.5263E-01 5.2782E-01 5.0423E-01 4.8205E-01 4.6131E-01 4.4200E-01 4.2402E-01 4.0730E-01
5.5155E-01 5.2299E-01 4.9600E-01 4.7084E-01 4.4754E-01 4.2605E-01 4.0624E-01 3.8798E-01 3.7113E-01

N = 3 X = WMM/WCR = 5.40000E-01 WT FLOW CALC = 6.60185E-02 D = -1.41097E-02

WSH = 7.46373E-01 WMH = 5.80728E-01 WPH = 4.77861E-01
WSM = 6.92716E-01 WMM = 5.29932E-01 WPM = 4.30366E-01
WST = 6.40219E-01 WMT = 4.81551E-01 WPT = 3.85965E-01

A(IK)

5.9603E-01 5.7352E-01 5.5116E-01 5.2951E-01 5.0886E-01 4.8933E-01 4.7096E-01 4.5371E-01 4.3753E-01
5.7189E-01 5.4594E-01 5.2094E-01 4.9729E-01 4.7512E-01 4.5446E-01 4.3525E-01 4.1740E-01 4.0083E-01
5.4439E-01 5.1561E-01 4.8857E-01 4.6347E-01 4.4029E-01 4.1896E-01 3.9933E-01 3.8126E-01 3.6461E-01

N = 4 X = WMM/WCR = 5.29932E-01 WT FLOW CALC = 6.50998E-02 D = 3.59118E-06

SECOND STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 6.51000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.02000E-03	9.79600E 01	5.89700E 01	6.68750E 02	8.03840E 02	0.00000E-39	1.99200E-01
MEAN	6.42000E-03	9.79600E 01	5.89700E 01	6.68750E 02	8.03840E 02		
TIP	6.82000E-03	9.79600E 01	5.89700E 01	6.68750E 02	8.03840E 02	0.00000E-39	2.25800E-01

	BETA		
HUB	3.00000E 01	3.00000E 01	3.00000E 01
MEAN	3.00000E 01	3.00000E 01	3.00000E 01
TIP	3.00000E 01	3.00000E 01	3.00000E 01

ID1 = 0 ID2 = 1 X = 5.58000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.29014E 00 VSM = 1.31217E 00 VST = 1.33457E 00 VPH = 8.20434E-01

VPM = 8.09715E-01 VPT = 7.99136E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-1.25502E 00	1.25700E 03	-2.08647E-03
2	-1.23442E 00	1.25700E 03	-2.05222E-03
3	-1.21448E 00	1.25700E 03	-2.01907E-03
4	-1.19517E 00	1.25700E 03	-1.98697E-03
5	-1.17647E 00	1.25700E 03	-1.95588E-03
6	-1.15835E 00	1.25700E 03	-1.92575E-03
7	-1.14077E 00	1.25700E 03	-1.89653E-03
8	-1.12372E 00	1.25700E 03	-1.86819E-03
9	-1.10717E 00	1.25700E 03	-1.84068E-03

IK	M(IK)	N(IK)
1	1.61589E-02	1.23685E 03
2	1.20202E-02	1.24198E 03

```
3       7.94889E-03          1.24705E 03
4       3.94285E-03          1.25205E 03
5       0.00000E-39          1.25700E 03
6      -3.88163E-03          1.26189E 03
7      -7.70391E-03          1.26672E 03
8      -1.14686E-02          1.27150E 03
9      -1.51775E-02          1.27622E 03

 PH = -1.65852E 01   PM =  0.00000E-39   PT =  1.68469E 01

QH =  1.01629E 00   QM =  1.00000E 00   QT =  9.84937E-01


WSH =  7.64143E-01  WMH =  5.92294E-01  WPH =  4.85938E-01
WSM =  7.32188E-01  WMM =  5.58000E-01  WPM =  4.51821E-01
WST =  7.00357E-01  WMT =  5.24783E-01  WPT =  4.19373E-01

  A(IK)

6.0310E-01 5.8099E-01 5.5872E-01 5.3698E-01 5.1612E-01 4.9631E-01 4.7763E-01 4.6005E-01 4.4355E-01
5.9005E-01 5.6503E-01 5.4034E-01 5.1661E-01 4.9414E-01 4.7302E-01 4.5328E-01 4.3486E-01 4.1768E-01
5.7558E-01 5.4780E-01 5.2089E-01 4.9540E-01 4.7154E-01 4.4933E-01 4.2875E-01 4.0968E-01 3.9202E-01

N = 1  X = WMM/WCR =  5.58000E-01  WT FLOW CALC =  6.82378E-02   D = -4.82000E-02


WSH =  6.98585E-01  WMH =  5.41480E-01  WPH =  4.44248E-01
WSM =  6.66580E-01  WMM =  5.08000E-01  WPM =  4.11335E-01
WST =  6.34634E-01  WMT =  4.75536E-01  WPT =  3.80018E-01

  A(IK)

5.7473E-01 5.5024E-01 5.2659E-01 5.0415E-01 4.8305E-01 4.6332E-01 4.4492E-01 4.2777E-01 4.1178E-01
5.5867E-01 5.3170E-01 5.0605E-01 4.8201E-01 4.5965E-01 4.3891E-01 4.1972E-01 4.0196E-01 3.8552E-01
5.4125E-01 5.1200E-01 4.8459E-01 4.5919E-01 4.3579E-01 4.1428E-01 3.9452E-01 3.7635E-01 3.5963E-01

N = 2  X = WMM/WCR =  5.08000E-01  WT FLOW CALC =  6.36206E-02   D =  2.27257E-02


WSH =  7.31364E-01  WMH =  5.66887E-01  WPH =  4.65093E-01
WSM =  6.99384E-01  WMM =  5.33000E-01  WPM =  4.31578E-01
WST =  6.67496E-01  WMT =  5.00159E-01  WPT =  3.99696E-01

  A(IK)
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5.8970E-01 5.6626E-01 5.4319E-01 5.2101E-01 4.9997E-01 4.8015E-01 4.6156E-01 4.4416E-01 4.2789E-01
5.7512E-01 5.4898E-01 5.2370E-01 4.9973E-01 4.7724E-01 4.5627E-01 4.3676E-01 4.1863E-01 4.0179E-01
5.5915E-01 5.3048E-01 5.0322E-01 4.7769E-01 4.5399E-01 4.3208E-01 4.1186E-01 3.9321E-01 3.7599E-01

N = 3 X = WMM/WCR = 5.33000E-01 WT FLOW CALC = 6.59830E-02 D = -1.35632E-02

WSH = 7.18937E-01 WMH = 5.57255E-01 WPH = 4.57191E-01
WSM = 6.86948E-01 WMM = 5.23522E-01 WPM = 4.23904E-01
WST = 6.55037E-01 WMT = 4.90824E-01 WPT = 3.92236E-01

A(IK)

5.8420E-01 5.6034E-01 5.3702E-01 5.1473E-01 4.9365E-01 4.7385E-01 4.5531E-01 4.3800E-01 4.2183E-01
5.6905E-01 5.4257E-01 5.1713E-01 4.9311E-01 4.7065E-01 4.4976E-01 4.3036E-01 4.1236E-01 3.9567E-01
5.5253E-01 5.2361E-01 4.9626E-01 4.7076E-01 4.4716E-01 4.2539E-01 4.0534E-01 3.8686E-01 3.6983E-01

N = 4 X = WMM/WCR = 5.23522E-01 WT FLOW CALC = 6.50998E-02 D = 3.49432E-06

SECOND STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 6.51000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.13000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.99160E 02	0.00000E-39	1.99200E-01
MEAN	6.54000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.99160E 02		
TIP	6.95000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.99160E 02	0.00000E-39	2.25800E-01

	BETA		
HUB	1.50000E 01	1.50000E 01	1.50000E 01
MEAN	1.50000E 01	1.50000E 01	1.50000E 01
TIP	1.50000E 01	1.50000E 01	1.50000E 01

ID1 = 0 ID2 = 2 X = 5.47000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.29616E 00 VSM = 1.31885E 00 VST = 1.34193E 00 VPH = 8.17472E-01

VPM = 8.06527E-01 VPT = 7.95728E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.36282E-01	6.50671E 02	-5.59068E-04
2	-3.30761E-01	6.50671E 02	-5.49889E-04
3	-3.25418E-01	6.50671E 02	-5.41007E-04
4	-3.20245E-01	6.50671E 02	-5.32408E-04
5	-3.15234E-01	6.50671E 02	-5.24077E-04
6	-3.10378E-01	6.50671E 02	-5.16003E-04
7	-3.05669E-01	6.50671E 02	-5.08174E-04
8	-3.01100E-01	6.50671E 02	-5.00579E-04
9	-2.96666E-01	6.50671E 02	-4.93208E-04

IK	M(IK)	N(IK)
1	4.32975E-03	6.47860E 02
2	3.22080E-03	6.48579E 02

```
3      2.12990E-03          6.49287E 02
4      1.05648E-03          6.49984E 02
5      0.00000E-39          6.50671E 02
6     -1.04008E-03          6.51348E 02
7     -2.06426E-03          6.52016E 02
8     -3.07301E-03          6.52674E 02
9     -4.06680E-03          6.53323E 02

 PH = -8.63542E 00    PM =  0.00000E-39    PT =  8.67172E 00

QH =  1.00434E 00    QM =  1.00000E 00    QT =  9.95941E-01


WSH =  7.28886E-01  WMH =  5.62342E-01  WPH =  4.59699E-01
WSM =  7.21409E-01  WMM =  5.47000E-01  WPM =  4.41170E-01
WST =  7.13725E-01  WMT =  5.31866E-01  WPT =  4.23220E-01

  A(IK)

5.8862E-01 5.6465E-01 5.4108E-01 5.1845E-01 4.9700E-01 4.7682E-01 4.5793E-01 4.4026E-01 4.2376E-01
5.8531E-01 5.5940E-01 5.3400E-01 5.0971E-01 4.8679E-01 4.6533E-01 4.4532E-01 4.2670E-01 4.0937E-01
5.8183E-01 5.5395E-01 5.2673E-01 5.0080E-01 4.7646E-01 4.5377E-01 4.3271E-01 4.1319E-01 3.9512E-01

N = 1  X = WMM/WCR =  5.47000E-01  WT FLOW CALC =  6.81717E-02   D = -4.71844E-02


WSH =  6.63797E-01  WMH =  5.12125E-01  WPH =  4.18648E-01
WSM =  6.55466E-01  WMM =  4.97000E-01  WPM =  4.00844E-01
WST =  6.46901E-01  WMT =  4.82068E-01  WPT =  3.83595E-01

  A(IK)

5.5720E-01 5.3142E-01 5.0693E-01 4.8398E-01 4.6260E-01 4.4275E-01 4.2434E-01 4.0728E-01 3.9144E-01
5.5276E-01 5.2506E-01 4.9885E-01 4.7438E-01 4.5169E-01 4.3071E-01 4.1135E-01 3.9346E-01 3.7694E-01
5.4810E-01 5.1847E-01 4.9057E-01 4.6462E-01 4.4068E-01 4.1865E-01 3.9839E-01 3.7977E-01 3.6263E-01

N = 2  X = WMM/WCR =  4.97000E-01  WT FLOW CALC =  6.34041E-02   D =  2.60502E-02


WSH =  6.96342E-01  WMH =  5.37234E-01  WPH =  4.39174E-01
WSM =  6.88438E-01  WMM =  5.22000E-01  WPM =  4.21007E-01
WST =  6.80313E-01  WMT =  5.06967E-01  WPT =  4.03408E-01

  A(IK)
```

5.7365E-01 5.4864E-01 5.2451E-01 5.0163E-01 4.8016E-01 4.6009E-01 4.4140E-01 4.2406E-01 4.0780E-01
5.6979E-01 5.4284E-01 5.1692E-01 4.9246E-01 4.6959E-01 4.4832E-01 4.2858E-01 4.1029E-01 3.9334E-01
5.6573E-01 5.3683E-01 5.0914E-01 4.8312E-01 4.5890E-01 4.3649E-01 4.1579E-01 3.9668E-01 3.7904E-01

N = 3 X = WMM/WCR = 5.22000E-01 WT FLOW CALC = 6.58416E-02 D = -1.13924E-02

WSH = 6.86286E-01 WMH = 5.29476E-01 WPH = 4.32832E-01
WSM = 6.78251E-01 WMM = 5.14276E-01 WPM = 4.14777E-01
WST = 6.69990E-01 WMT = 4.99274E-01 WPT = 3.97286E-01

A(IK)

5.6873E-01 5.4344E-01 5.1918E-01 4.9627E-01 4.7481E-01 4.5480E-01 4.3618E-01 4.1888E-01 4.0279E-01
5.6469E-01 5.3747E-01 5.1144E-01 4.8696E-01 4.6413E-01 4.4294E-01 4.2331E-01 4.0514E-01 3.8831E-01
5.6044E-01 5.3128E-01 5.0350E-01 4.7749E-01 4.5334E-01 4.3103E-01 4.1046E-01 3.9150E-01 3.7401E-01

N = 4 X = WMM/WCR = 5.14276E-01 WT FLOW CALC = 6.50998E-02 D = 3.15160E-06

SECOND STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 6.51000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.25000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.93810E 02	0.00000E-39	1.99200E-01
MEAN	6.67000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.93810E 02		
TIP	7.09000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.93810E 02	0.00000E-39	2.25800E-01

	BETA		
HUB	5.00000E 00	5.00000E 00	5.00000E 00
MEAN	5.00000E 00	5.00000E 00	5.00000E 00
TIP	5.00000E 00	5.00000E 00	5.00000E 00

ID1 = 0 ID2 = 3 X = 5.38000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.30276E 00 VSM = 1.32612E 00 VST = 1.34990E 00 VPH = 8.14254E-01

VPM = 8.03087E-01 VPT = 7.92074E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.81331E-02	2.19110E 02	-6.33963E-05
2	-3.75071E-02	2.19110E 02	-6.23555E-05
3	-3.69012E-02	2.19110E 02	-6.13483E-05
4	-3.63147E-02	2.19110E 02	-6.03731E-05
5	-3.57465E-02	2.19110E 02	-5.94285E-05
6	-3.51957E-02	2.19110E 02	-5.85129E-05
7	-3.46617E-02	2.19110E 02	-5.76251E-05
8	-3.41437E-02	2.19110E 02	-5.67639E-05
9	-3.36409E-02	2.19110E 02	-5.59280E-05

IK	M(IK)	N(IK)
1	4.90979E-04	2.19002E 02
2	3.65227E-04	2.19029E 02

```
3      2.41523E-04          2.19057E 02
4      1.19802E-04          2.19083E 02
5      0.00000E-39          2.19110E 02
6     -1.17941E-04          2.19135E 02
7     -2.34079E-04          2.19161E 02
8     -3.48469E-04          2.19186E 02
9     -4.61160E-04          2.19211E 02

 PH = -2.91345E 00    PM =  0.00000E-39   PT =  2.91484E 00

QH =  1.00049E 00    QM =  1.00000E 00   QT =  9.99539E-01


WSH =  7.06907E-01  WMH =  5.42623E-01  WPH =  4.41833E-01
WSM =  7.13453E-01  WMM =  5.38000E-01  WPM =  4.32061E-01
WST =  7.20031E-01  WMT =  5.33395E-01  WPT =  4.22489E-01

  A(IK)

5.7868E-01 5.5347E-01 5.2901E-01 5.0574E-01 4.8383E-01 4.6334E-01 4.4424E-01 4.2645E-01 4.0989E-01
5.8171E-01 5.5498E-01 5.2890E-01 5.0405E-01 4.8068E-01 4.5885E-01 4.3855E-01 4.1968E-01 4.0217E-01
5.8470E-01 5.5647E-01 5.2878E-01 5.0235E-01 4.7752E-01 4.5436E-01 4.3287E-01 4.1296E-01 3.9453E-01

N = 1  X = WMM/WCR =  5.38000E-01  WT FLOW CALC =  6.82572E-02   D = -4.84969E-02


WSH =  6.41737E-01  WMH =  4.92598E-01  WPH =  4.01100E-01
WSM =  6.47147E-01  WMM =  4.88000E-01  WPM =  3.91907E-01
WST =  6.52567E-01  WMT =  4.83418E-01  WPT =  3.82903E-01

  A(IK)

5.4524E-01 5.1856E-01 4.9346E-01 4.7010E-01 4.4847E-01 4.2847E-01 4.1000E-01 3.9294E-01 3.7715E-01
5.4823E-01 5.1982E-01 4.9305E-01 4.6813E-01 4.4508E-01 4.2383E-01 4.0425E-01 3.8620E-01 3.6955E-01
5.5119E-01 5.2107E-01 4.9261E-01 4.6613E-01 4.4168E-01 4.1919E-01 3.9852E-01 3.7952E-01 3.6205E-01

N = 2  X = WMM/WCR =  4.88000E-01  WT FLOW CALC =  6.33557E-02   D =  2.67943E-02


WSH =  6.74322E-01  WMH =  5.17611E-01  WPH =  4.21466E-01
WSM =  6.80300E-01  WMM =  5.13000E-01  WPM =  4.11984E-01
WST =  6.86299E-01  WMT =  5.08407E-01  WPT =  4.02696E-01

  A(IK)
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5.6268E-01 5.3661E-01 5.1172E-01 4.8833E-01 4.6649E-01 4.4620E-01 4.2737E-01 4.0991E-01 3.9371E-01
5.6573E-01 5.3801E-01 5.1147E-01 4.8650E-01 4.6322E-01 4.4163E-01 4.2164E-01 4.0315E-01 3.8604E-01
5.6873E-01 5.3939E-01 5.1120E-01 4.8465E-01 4.5994E-01 4.3706E-01 4.1593E-01 3.9644E-01 3.7846E-01

N = 3 X = WMM/WCR = 5.13000E-01 WT FLOW CALC = 6.58603E-02 D = -1.16787E-02

WSH = 6.64282E-01 WMH = 5.09903E-01 WPH = 4.15191E-01
WSM = 6.70084E-01 WMM = 5.05296E-01 WPM = 4.05797E-01
WST = 6.75905E-01 WMT = 5.00707E-01 WPT = 3.96597E-01

A(IK)

5.5746E-01 5.3117E-01 5.0620E-01 4.8280E-01 4.6101E-01 4.4080E-01 4.2207E-01 4.0473E-01 3.8865E-01
5.6049E-01 5.3253E-01 5.0590E-01 4.8092E-01 4.5770E-01 4.3620E-01 4.1633E-01 3.9797E-01 3.8100E-01
5.6349E-01 5.3388E-01 5.0558E-01 4.7903E-01 4.5438E-01 4.3161E-01 4.1061E-01 3.9127E-01 3.7344E-01

N = 4 X = WMM/WCR = 5.05296E-01 WT FLOW CALC = 6.50998E-02 D = 3.18140E-06

SECOND STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 6.51000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.29000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.91800E 02	0.00000E-39	1.99200E-01
MEAN	6.71000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.91800E 02		
TIP	7.13000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.91800E 02	0.00000E-39	2.25800E-01

	BETA		
HUB	0.00000E-39	0.00000E-39	0.00000E-39
MEAN	0.00000E-39	0.00000E-39	0.00000E-39
TIP	0.00000E-39	0.00000E-39	0.00000E-39

ID1 = 0 ID2 = 4 X = 5.34000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.30497E 00 VSM = 1.32837E 00 VST = 1.35219E 00 VPH = 8.13183E-01

VPM = 8.02032E-01 VPT = 7.91033E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-0.00000E-39	0.00000E-39	-0.00000E-39
2	-0.00000E-39	0.00000E-39	-0.00000E-39
3	-0.00000E-39	0.00000E-39	-0.00000E-39
4	-0.00000E-39	0.00000E-39	-0.00000E-39
5	-0.00000E-39	0.00000E-39	-0.00000E-39
6	-0.00000E-39	0.00000E-39	-0.00000E-39
7	-0.00000E-39	0.00000E-39	-0.00000E-39
8	-0.00000E-39	0.00000E-39	-0.00000E-39
9	-0.00000E-39	0.00000E-39	-0.00000E-39

IK	M(IK)	N(IK)
1	0.00000E-39	0.00000E-39
2	0.00000E-39	0.00000E-39

```
3      0.00000E-39          0.00000E-39
4      0.00000E-39          0.00000E-39
5      0.00000E-39          0.00000E-39
6     -0.00000E-39          0.00000E-39
7     -0.00000E-39          0.00000E-39
8     -0.00000E-39          0.00000E-39
9     -0.00000E-39          0.00000E-39

 PH = -0.00000E-39   PM =  0.00000E-39   PT =  0.00000E-39

QH =  1.00000E 00   QM =  1.00000E 00   QT =  1.00000E 00


WSH =  6.96852E-01  WMH =  5.34000E-01  WPH =  4.34240E-01
WSM =  7.09349E-01  WMM =  5.34000E-01  WPM =  4.28285E-01
WST =  7.22069E-01  WMT =  5.34000E-01  WPT =  4.22412E-01

  A(IK)

5.7390E-01 5.4823E-01 5.2345E-01 4.9997E-01 4.7793E-01 4.5737E-01 4.3823E-01 4.2044E-01 4.0390E-01
5.7981E-01 5.5278E-01 5.2647E-01 5.0144E-01 4.7793E-01 4.5601E-01 4.3563E-01 4.1671E-01 3.9917E-01
5.8561E-01 5.5729E-01 5.2948E-01 5.0291E-01 4.7793E-01 4.5464E-01 4.3303E-01 4.1300E-01 3.9447E-01

N = 1  X = WMM/WCR =  5.34000E-01  WT FLOW CALC =  6.81274E-02   D = -4.65035E-02


WSH =  6.31604E-01  WMH =  4.84000E-01  WPH =  3.93581E-01
WSM =  6.42930E-01  WMM =  4.84000E-01  WPM =  3.88183E-01
WST =  6.54459E-01  WMT =  4.84000E-01  WPT =  3.82860E-01

  A(IK)

5.3952E-01 5.1254E-01 4.8726E-01 4.6379E-01 4.4212E-01 4.2212E-01 4.0368E-01 3.8667E-01 3.7094E-01
5.4590E-01 5.1725E-01 4.9030E-01 4.6525E-01 4.4212E-01 4.2080E-01 4.0118E-01 3.8312E-01 3.6646E-01
5.5222E-01 5.2195E-01 4.9335E-01 4.6671E-01 4.4212E-01 4.1948E-01 3.9869E-01 3.7958E-01 3.6201E-01

N = 2  X = WMM/WCR =  4.84000E-01  WT FLOW CALC =  6.31769E-02   D =  2.95401E-02


WSH =  6.64228E-01  WMH =  5.09000E-01  WPH =  4.13910E-01
WSM =  6.76139E-01  WMM =  5.09000E-01  WPM =  4.08234E-01
WST =  6.88264E-01  WMT =  5.09000E-01  WPT =  4.02636E-01

  A(IK)
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5.5743E-01 5.3097E-01 5.0584E-01 4.8228E-01 4.6036E-01 4.4003E-01 4.2121E-01 4.0377E-01 3.8761E-01
5.6361E-01 5.3562E-01 5.0888E-01 4.8375E-01 4.6036E-01 4.3869E-01 4.1865E-01 4.0012E-01 3.8299E-01
5.6971E-01 5.4025E-01 5.1192E-01 4.8522E-01 4.6036E-01 4.3735E-01 4.1609E-01 3.9649E-01 3.7841E-01

N = 3  X = WMM/WCR =  5.09000E-01  WT FLOW CALC =  6.57059E-02  D = -9.30756E-03


WSH =  6.56284E-01  WMH =  5.02912E-01  WPH =  4.08960E-01
WSM =  6.68053E-01  WMM =  5.02912E-01  WPM =  4.03352E-01
WST =  6.80032E-01  WMT =  5.02912E-01  WPT =  3.97820E-01

  A(IK)

5.5320E-01 5.2658E-01 5.0140E-01 4.7785E-01 4.5598E-01 4.3572E-01 4.1698E-01 3.9964E-01 3.8358E-01
5.5944E-01 5.3126E-01 5.0444E-01 4.7932E-01 4.5598E-01 4.3438E-01 4.1444E-01 3.9602E-01 3.7900E-01
5.6559E-01 5.3591E-01 5.0748E-01 4.8079E-01 4.5598E-01 4.3305E-01 4.1190E-01 3.9241E-01 3.7445E-01

N = 4  X = WMM/WCR =  5.02912E-01  WT FLOW CALC =  6.50998E-02  D =  2.63751E-06
```

SECOND STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 6.51000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.33000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.88460E 02	0.00000E-39	1.99200E-01
MEAN	6.75000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.88460E 02		
TIP	7.18000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.88460E 02	0.00000E-39	2.25800E-01

	BETA		
HUB	5.00000E 00	5.00000E 00	5.00000E 00
MEAN	5.00000E 00	5.00000E 00	5.00000E 00
TIP	5.00000E 00	5.00000E 00	5.00000E 00

ID1 = 0 ID2 = 5 X = 5.31000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.30718E 00 VSM = 1.33062E 00 VST = 1.35505E 00 VPH = 8.12115E-01

VPM = 8.00978E-01 VPT = 7.89734E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.81331E-02	2.19110E 02	-6.33963E-05
2	-3.75071E-02	2.19110E 02	-6.23555E-05
3	-3.69012E-02	2.19110E 02	-6.13483E-05
4	-3.63147E-02	2.19110E 02	-6.03731E-05
5	-3.57465E-02	2.19110E 02	-5.94285E-05
6	-3.51957E-02	2.19110E 02	-5.85129E-05
7	-3.46617E-02	2.19110E 02	-5.76251E-05
8	-3.41437E-02	2.19110E 02	-5.67639E-05
9	-3.36409E-02	2.19110E 02	-5.59280E-05

IK	M(IK)	N(IK)
1	4.90979E-04	2.19002E 02
2	3.65227E-04	2.19029E 02

```
3      2.41523E-04          2.19057E 02
4      1.19802E-04          2.19083E 02
5      0.00000E-39          2.19110E 02
6     -1.17941E-04          2.19135E 02
7     -2.34079E-04          2.19161E 02
8     -3.48469E-04          2.19186E 02
9     -4.61160E-04          2.19211E 02

 PH = -2.91345E 00   PM =  0.00000E-39   PT =  2.91484E 00

QH =  1.00049E 00   QM =  1.00000E 00   QT =  9.99539E-01


WSH =  7.00150E-01  WMH =  5.35619E-01  WPH =  4.34984E-01
WSM =  7.06558E-01  WMM =  5.31000E-01  WPM =  4.25319E-01
WST =  7.13298E-01  WMT =  5.26399E-01  WPT =  4.15715E-01

  A(IK)

5.7548E-01 5.4974E-01 5.2485E-01 5.0123E-01 4.7905E-01 4.5834E-01 4.3907E-01 4.2115E-01 4.0449E-01
5.7851E-01 5.5122E-01 5.2470E-01 4.9950E-01 4.7586E-01 4.5383E-01 4.3337E-01 4.1439E-01 3.9680E-01
5.8164E-01 5.5279E-01 5.2460E-01 4.9780E-01 4.7266E-01 4.4928E-01 4.2762E-01 4.0759E-01 3.8907E-01

N = 1  X = WMM/WCR =  5.31000E-01  WT FLOW CALC =  6.79704E-02   D = -4.40922E-02


WSH =  6.34759E-01  WMH =  4.85595E-01  WPH =  3.94359E-01
WSM =  6.40027E-01  WMM =  4.81000E-01  WPM =  3.85270E-01
WST =  6.45570E-01  WMT =  4.76422E-01  WPT =  3.76246E-01

  A(IK)

5.4132E-01 5.1419E-01 4.8876E-01 4.6514E-01 4.4330E-01 4.2315E-01 4.0458E-01 3.8743E-01 3.7159E-01
5.4428E-01 5.1542E-01 4.8830E-01 4.6312E-01 4.3988E-01 4.1849E-01 3.9882E-01 3.8071E-01 3.6403E-01
5.4737E-01 5.1673E-01 4.8789E-01 4.6112E-01 4.3646E-01 4.1381E-01 3.9303E-01 3.7397E-01 3.5645E-01

N = 2  X = WMM/WCR =  4.81000E-01  WT FLOW CALC =  6.29851E-02   D =  3.24866E-02


WSH =  6.67454E-01  WMH =  5.10607E-01  WPH =  4.14672E-01
WSM =  6.73293E-01  WMM =  5.06000E-01  WPM =  4.05295E-01
WST =  6.79437E-01  WMT =  5.01410E-01  WPT =  3.95980E-01

  A(IK)
```

```
5.5912E-01 5.3256E-01 5.0729E-01 4.8358E-01 4.6151E-01 4.4104E-01 4.2207E-01 4.0450E-01 3.8823E-01
5.6215E-01 5.3392E-01 5.0699E-01 4.8171E-01 4.5821E-01 4.3644E-01 4.1633E-01 3.9776E-01 3.8059E-01
5.6529E-01 5.3538E-01 5.0674E-01 4.7986E-01 4.5489E-01 4.3182E-01 4.1056E-01 3.9097E-01 3.7293E-01

N = 3  X = WMM/WCR =  5.06000E-01  WT FLOW CALC =  6.55314E-02   D = -6.62701E-03


WSH =  6.61816E-01  WMH =  5.06294E-01  WPH =  4.11169E-01
WSM =  6.67557E-01  WMM =  5.01689E-01  WPM =  4.01842E-01
WST =  6.73598E-01  WMT =  4.97101E-01  WPT =  3.92578E-01

  A(IK)

5.5616E-01 5.2947E-01 5.0416E-01 4.8046E-01 4.5842E-01 4.3799E-01 4.1909E-01 4.0159E-01 3.8538E-01
5.5918E-01 5.3082E-01 5.0383E-01 4.7856E-01 4.5510E-01 4.3339E-01 4.1335E-01 3.9485E-01 3.7776E-01
5.6231E-01 5.3225E-01 5.0356E-01 4.7669E-01 4.5176E-01 4.2875E-01 4.0757E-01 3.8807E-01 3.7011E-01

N = 4  X = WMM/WCR =  5.01689E-01  WT FLOW CALC =  6.50999E-02   D =  1.95205E-06
```

SECOND STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 6.51000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.45000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.83780E 02	0.00000E-39	1.99200E-01
MEAN	6.88000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.83780E 02		
TIP	7.31000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.83780E 02	0.00000E-39	2.25800E-01

	BETA		
HUB	1.50000E 01	1.50000E 01	1.50000E 01
MEAN	1.50000E 01	1.50000E 01	1.50000E 01
TIP	1.50000E 01	1.50000E 01	1.50000E 01

ID1 = 0 ID2 = 6 X = 5.23000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.31383E 00 VSM = 1.33796E 00 VST = 1.36253E 00 VPH = 8.08917E-01

VPM = 7.97562E-01 VPT = 7.86366E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.36282E-01	6.50671E 02	-5.59068E-04
2	-3.30761E-01	6.50671E 02	-5.49889E-04
3	-3.25418E-01	6.50671E 02	-5.41007E-04
4	-3.20245E-01	6.50671E 02	-5.32408E-04
5	-3.15234E-01	6.50671E 02	-5.24077E-04
6	-3.10378E-01	6.50671E 02	-5.16003E-04
7	-3.05669E-01	6.50671E 02	-5.08174E-04
8	-3.01100E-01	6.50671E 02	-5.00579E-04
9	-2.96666E-01	6.50671E 02	-4.93208E-04

IK	M(IK)	N(IK)
1	4.32975E-03	6.47860E 02
2	3.22080E-03	6.48579E 02

```
3      2.12990E-03          6.49287E 02
4      1.05648E-03          6.49984E 02
5      0.00000E-39          6.50671E 02
6     -1.04008E-03          6.51348E 02
7     -2.06426E-03          6.52016E 02
8     -3.07301E-03          6.52674E 02
9     -4.06680E-03          6.53323E 02

 PH = -8.63542E 00   PM =  0.00000E-39   PT =  8.67172E 00

QH =  1.00434E 00   QM =  1.00000E 00   QT =  9.95941E-01


WSH =  7.07155E-01  WMH =  5.38238E-01  WPH =  4.35390E-01
WSM =  6.99752E-01  WMM =  5.23000E-01  WPM =  4.17125E-01
WST =  6.92114E-01  WMT =  5.07963E-01  WPT =  3.99445E-01

  A(IK)

5.7879E-01 5.5277E-01 5.2749E-01 5.0344E-01 4.8084E-01 4.5973E-01 4.4007E-01 4.2180E-01 4.0481E-01
5.7529E-01 5.4724E-01 5.2008E-01 4.9436E-01 4.7029E-01 4.4791E-01 4.2717E-01 4.0798E-01 3.9021E-01
5.7160E-01 5.4150E-01 5.1247E-01 4.8510E-01 4.5962E-01 4.3604E-01 4.1429E-01 3.9425E-01 3.7579E-01

N = 1  X = WMM/WCR =  5.23000E-01  WT FLOW CALC =  6.80610E-02   D = -4.54841E-02


WSH =  6.41178E-01  WMH =  4.88021E-01  WPH =  3.94769E-01
WSM =  6.32854E-01  WMM =  4.73000E-01  WPM =  3.77247E-01
WST =  6.24264E-01  WMT =  4.58166E-01  WPT =  3.60286E-01

  A(IK)

5.4492E-01 5.1737E-01 4.9147E-01 4.6738E-01 4.4510E-01 4.2454E-01 4.0558E-01 3.8808E-01 3.7193E-01
5.4024E-01 5.1071E-01 4.8306E-01 4.5745E-01 4.3388E-01 4.1223E-01 3.9235E-01 3.7409E-01 3.5730E-01
5.3530E-01 5.0381E-01 4.7444E-01 4.4738E-01 4.2258E-01 3.9991E-01 3.7920E-01 3.6025E-01 3.4289E-01

N = 2  X = WMM/WCR =  4.73000E-01  WT FLOW CALC =  6.29455E-02   D =  3.30946E-02


WSH =  6.74167E-01  WMH =  5.13130E-01  WPH =  4.15079E-01
WSM =  6.66303E-01  WMM =  4.98000E-01  WPM =  3.97186E-01
WST =  6.58189E-01  WMT =  4.83064E-01  WPT =  3.79865E-01

  A(IK)
```

5.6260E-01 5.3567E-01 5.0997E-01 4.8582E-01 4.6331E-01 4.4242E-01 4.2307E-01 4.0516E-01 3.8856E-01
5.5852E-01 5.2958E-01 5.0205E-01 4.7630E-01 4.5242E-01 4.3035E-01 4.1000E-01 3.9123E-01 3.7392E-01
5.5422E-01 5.2326E-01 4.9394E-01 4.6663E-01 4.4142E-01 4.1824E-01 3.9697E-01 3.7744E-01 3.5950E-01

N = 3 X = WMM/WCR = 4.98000E-01 WT FLOW CALC = 6.55571E-02 D = -7.02122E-03

WSH = 6.68293E-01 WMH = 5.08659E-01 WPH = 4.11463E-01
WSM = 6.60348E-01 WMM = 4.93549E-01 WPM = 3.93636E-01
WST = 6.52149E-01 WMT = 4.78632E-01 WPT = 3.76379E-01

A(IK)

5.5956E-01 5.3250E-01 5.0675E-01 4.8260E-01 4.6012E-01 4.3928E-01 4.1999E-01 4.0215E-01 3.8562E-01
5.5538E-01 5.2630E-01 4.9874E-01 4.7301E-01 4.4916E-01 4.2716E-01 4.0689E-01 3.8821E-01 3.7099E-01
5.5096E-01 5.1988E-01 4.9054E-01 4.6326E-01 4.3811E-01 4.1502E-01 3.9383E-01 3.7440E-01 3.5657E-01

N = 4 X = WMM/WCR = 4.93549E-01 WT FLOW CALC = 6.50999E-02 D = 2.04891E-06

SECOND STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 6.51000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.56000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.77760E 02	0.00000E-39	1.99200E-01
MEAN	7.00000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.77760E 02		
TIP	7.44000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.77760E 02	0.00000E-39	2.25800E-01

	BETA		
HUB	3.00000E 01	3.00000E 01	3.00000E 01
MEAN	3.00000E 01	3.00000E 01	3.00000E 01
TIP	3.00000E 01	3.00000E 01	3.00000E 01

ID1 = 0 ID2 = 7 X = 5.14000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.31996E 00 VSM = 1.34477E 00 VST = 1.37004E 00 VPH = 8.05997E-01

VPM = 7.94421E-01 VPT = 7.83012E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-1.25502E 00	1.25700E 03	-2.08647E-03
2	-1.23442E 00	1.25700E 03	-2.05222E-03
3	-1.21448E 00	1.25700E 03	-2.01907E-03
4	-1.19517E 00	1.25700E 03	-1.98697E-03
5	-1.17647E 00	1.25700E 03	-1.95588E-03
6	-1.15835E 00	1.25700E 03	-1.92575E-03
7	-1.14077E 00	1.25700E 03	-1.89653E-03
8	-1.12372E 00	1.25700E 03	-1.86819E-03
9	-1.10717E 00	1.25700E 03	-1.84068E-03

IK	M(IK)	N(IK)
1	1.61589E-02	1.23685E 03
2	1.20202E-02	1.24198E 03

```
3      7.94889E-03          1.24705E 03
4      3.94285E-03          1.25205E 03
5      0.00000E-39          1.25700E 03
6     -3.88163E-03          1.26189E 03
7     -7.70391E-03          1.26672E 03
8     -1.14686E-02          1.27150E 03
9     -1.51775E-02          1.27622E 03

 PH = -1.65852E 01   PM =  0.00000E-39   PT =  1.68469E 01

QH =  1.01629E 00   QM =  1.00000E 00   QT =  9.84937E-01


WSH =  7.22782E-01  WMH =  5.47577E-01  WPH =  4.41346E-01
WSM =  6.91212E-01  WMM =  5.14000E-01  WPM =  4.08333E-01
WST =  6.59602E-01  WMT =  4.81445E-01  WPT =  3.76978E-01

  A(IK)

5.8593E-01 5.5998E-01 5.3453E-01 5.1017E-01 4.8718E-01 4.6565E-01 4.4558E-01 4.2689E-01 4.0951E-01
5.7116E-01 5.4234E-01 5.1457E-01 4.8837E-01 4.6393E-01 4.4127E-01 4.2031E-01 4.0095E-01 3.8307E-01
5.5498E-01 5.2348E-01 4.9364E-01 4.6585E-01 4.4021E-01 4.1666E-01 3.9506E-01 3.7525E-01 3.5707E-01

N = 1  X = WMM/WCR =  5.14000E-01  WT FLOW CALC =  6.77831E-02   D = -4.12149E-02


WSH =  6.55708E-01  WMH =  4.96763E-01  WPH =  4.00389E-01
WSM =  6.23973E-01  WMM =  4.64000E-01  WPM =  3.68611E-01
WST =  5.92131E-01  WMT =  4.32199E-01  WPT =  3.38417E-01

  A(IK)

5.5289E-01 5.2510E-01 4.9882E-01 4.7427E-01 4.5151E-01 4.3048E-01 4.1106E-01 3.9313E-01 3.7656E-01
5.3513E-01 5.0498E-01 4.7685E-01 4.5089E-01 4.2705E-01 4.0521E-01 3.8519E-01 3.6684E-01 3.4999E-01
5.1602E-01 4.8375E-01 4.5405E-01 4.2694E-01 4.0228E-01 3.7988E-01 3.5950E-01 3.4093E-01 3.2399E-01

N = 2  X = WMM/WCR =  4.64000E-01  WT FLOW CALC =  6.25460E-02   D =  3.92317E-02


WSH =  6.89245E-01  WMH =  5.22170E-01  WPH =  4.20867E-01
WSM =  6.57593E-01  WMM =  4.89000E-01  WPM =  3.88472E-01
WST =  6.25866E-01  WMT =  4.56822E-01  WPT =  3.57697E-01

  A(IK)
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5.7019E-01 5.4317E-01 5.1719E-01 4.9265E-01 4.6971E-01 4.4837E-01 4.2858E-01 4.1023E-01 3.9323E-01
5.5390E-01 5.2426E-01 4.9620E-01 4.7003E-01 4.4582E-01 4.2351E-01 4.0298E-01 3.8409E-01 3.6670E-01
5.3623E-01 5.0419E-01 4.7430E-01 4.4676E-01 4.2155E-01 3.9851E-01 3.7748E-01 3.5826E-01 3.4067E-01

N = 3  X = WMM/WCR =  4.89000E-01  WT FLOW CALC =  6.52182E-02   D = -1.81574E-03


WSH =  6.87733E-01  WMH =  5.21024E-01  WPH =  4.19944E-01
WSM =  6.56076E-01  WMM =  4.87873E-01  WPM =  3.87576E-01
WST =  6.24345E-01  WMT =  4.55712E-01  WPT =  3.56828E-01

  A(IK)

5.6944E-01 5.4239E-01 5.1638E-01 4.9184E-01 4.6890E-01 4.4757E-01 4.2780E-01 4.0947E-01 3.9248E-01
5.5309E-01 5.2342E-01 4.9534E-01 4.6918E-01 4.4499E-01 4.2270E-01 4.0219E-01 3.8332E-01 3.6595E-01
5.3535E-01 5.0329E-01 4.7341E-01 4.4588E-01 4.2069E-01 3.9768E-01 3.7668E-01 3.5749E-01 3.3993E-01

N = 4  X = WMM/WCR =  4.87873E-01  WT FLOW CALC =  6.51000E-02   D =  5.21541E-07
```

SECOND STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 6.51000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.68000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.71740E 02	0.00000E-39	1.99200E-01
MEAN	7.13000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.71740E 02		
TIP	7.58000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.71740E 02	0.00000E-39	2.25800E-01

	BETA		
HUB	4.50000E 01	4.50000E 01	4.50000E 01
MEAN	4.50000E 01	4.50000E 01	4.50000E 01
TIP	4.50000E 01	4.50000E 01	4.50000E 01

ID1 = 0 ID2 = 8 X = 5.07000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.32668E 00 VSM = 1.35219E 00 VST = 1.37819E 00 VPH = 8.02823E-01

VPM = 7.91033E-01 VPT = 7.79416E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-2.51004E 00	1.77767E 03	-4.17294E-03
2	-2.46883E 00	1.77767E 03	-4.10443E-03
3	-2.42895E 00	1.77767E 03	-4.03813E-03
4	-2.39034E 00	1.77767E 03	-3.97394E-03
5	-2.35294E 00	1.77767E 03	-3.91176E-03
6	-2.31669E 00	1.77767E 03	-3.85150E-03
7	-2.28154E 00	1.77767E 03	-3.79306E-03
8	-2.24744E 00	1.77767E 03	-3.73637E-03
9	-2.21435E 00	1.77767E 03	-3.68135E-03

IK	M(IK)	N(IK)
1	3.23177E-02	1.72113E 03
2	2.40403E-02	1.73544E 03

3	1.58978E-02	1.74963E 03
4	7.88571E-03	1.76370E 03
5	0.00000E-39	1.77767E 03
6	-7.76326E-03	1.79152E 03
7	-1.54078E-02	1.80527E 03
8	-2.29373E-02	1.81891E 03
9	-3.03550E-02	1.83245E 03

PH = -2.32690E 01 PM = 0.00000E-39 PT = 2.40091E 01

QH = 1.03285E 00 QM = 1.00000E 00 QT = 9.70101E-01

WSH = 7.42399E-01 WMH = 5.59590E-01 WPH = 4.49252E-01
WSM = 6.85560E-01 WMM = 5.07000E-01 WPM = 4.01054E-01
WST = 6.29849E-01 WMT = 4.57013E-01 WPT = 3.56203E-01

A(IK)

5.9438E-01 5.6873E-01 5.4320E-01 5.1856E-01 4.9519E-01 4.7322E-01 4.5268E-01 4.3352E-01 4.1569E-01
5.6836E-01 5.3883E-01 5.1047E-01 4.8377E-01 4.5893E-01 4.3594E-01 4.1472E-01 3.9516E-01 3.7711E-01
5.3852E-01 5.0592E-01 4.7546E-01 4.4739E-01 4.2169E-01 3.9823E-01 3.7682E-01 3.5727E-01 3.3939E-01

N = 1 X = WMM/WCR = 5.07000E-01 WT FLOW CALC = 6.77501E-02 D = -4.07077E-02

WSH = 6.73886E-01 WMH = 5.07948E-01 WPH = 4.07793E-01
WSM = 6.17950E-01 WMM = 4.57000E-01 WPM = 3.61502E-01
WST = 5.63000E-01 WMT = 4.08508E-01 WPT = 3.18398E-01

A(IK)

5.6246E-01 5.3454E-01 5.0790E-01 4.8289E-01 4.5961E-01 4.3804E-01 4.1810E-01 3.9967E-01 3.8263E-01
5.3162E-01 5.0084E-01 4.7221E-01 4.4584E-01 4.2168E-01 3.9959E-01 3.7939E-01 3.6089E-01 3.4393E-01
4.9743E-01 4.6462E-01 4.3473E-01 4.0767E-01 3.8322E-01 3.6110E-01 3.4108E-01 3.2291E-01 3.0637E-01

N = 2 X = WMM/WCR = 4.57000E-01 WT FLOW CALC = 6.24064E-02 D = 4.13765E-02

WSH = 7.08142E-01 WMH = 5.33769E-01 WPH = 4.28522E-01
WSM = 6.51755E-01 WMM = 4.82000E-01 WPM = 3.81278E-01
WST = 5.96424E-01 WMT = 4.32761E-01 WPT = 3.37301E-01

A(IK)

5.7925E-01 5.5230E-01 5.2609E-01 5.0118E-01 4.7777E-01 4.5595E-01 4.3566E-01 4.1683E-01 3.9936E-01
5.5075E-01 5.2044E-01 4.9182E-01 4.6520E-01 4.4063E-01 4.1803E-01 3.9728E-01 3.7821E-01 3.6069E-01
5.1867E-01 4.8581E-01 4.5552E-01 4.2787E-01 4.0273E-01 3.7989E-01 3.5914E-01 3.4025E-01 3.2301E-01

N = 3 X = WMM/WCR = 4.82000E-01 WT FLOW CALC = 6.51320E-02 D = -4.92126E-04

SECOND STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 6.51000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.77000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.69060E 02	0.00000E-39	1.99200E-01
MEAN	7.21000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.69060E 02		
TIP	7.67000E-03	9.79600E 01	5.89700E 01	6.68750E 02	7.69060E 02	0.00000E-39	2.25800E-01

	BETA		
HUB	5.50000E 01	5.50000E 01	5.50000E 01
MEAN	5.50000E 01	5.50000E 01	5.50000E 01
TIP	5.50000E 01	5.50000E 01	5.50000E 01

ID1 = 0 ID2 = 9 X = 5.04000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.33175E 00 VSM = 1.35677E 00 VST = 1.38344E 00 VPH = 8.00451E-01

VPM = 7.88955E-01 VPT = 7.77113E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.36852E 00	2.05935E 03	-5.60017E-03
2	-3.31322E 00	2.05935E 03	-5.50823E-03
3	-3.25970E 00	2.05935E 03	-5.41926E-03
4	-3.20789E 00	2.05935E 03	-5.33311E-03
5	-3.15769E 00	2.05935E 03	-5.24967E-03
6	-3.10905E 00	2.05935E 03	-5.16879E-03
7	-3.06188E 00	2.05935E 03	-5.09037E-03
8	-3.01611E 00	2.05935E 03	-5.01429E-03
9	-2.97170E 00	2.05935E 03	-4.94045E-03

IK	M(IK)	N(IK)
1	4.33710E-02	1.97194E 03
2	3.22626E-02	1.99397E 03

```
3      2.13351E-02          2.01588E 03
4      1.05828E-02          2.03767E 03
5      0.00000E-39          2.05935E 03
6     -1.04185E-02          2.08092E 03
7     -2.06776E-02          2.10237E 03
8     -3.07823E-02          2.12373E 03
9     -4.07370E-02          2.14497E 03

 PH = -2.68101E 01   PM =  0.00000E-39   PT =  2.79606E 01

QH =  1.04433E 00   QM =  1.00000E 00   QT =  9.60082E-01


WSH =  7.56707E-01  WMH =  5.68207E-01  WPH =  4.54822E-01
WSM =  6.83814E-01  WMM =  5.04000E-01  WPM =  3.97633E-01
WST =  6.13889E-01  WMT =  4.43740E-01  WPT =  3.44836E-01

  A(IK)

6.0020E-01 5.7482E-01 5.4928E-01 5.2447E-01 5.0083E-01 4.7854E-01 4.5766E-01 4.3817E-01 4.2000E-01
5.6749E-01 5.3757E-01 5.0886E-01 4.8187E-01 4.5677E-01 4.3356E-01 4.1217E-01 3.9246E-01 3.7429E-01
5.2922E-01 4.9606E-01 4.6530E-01 4.3710E-01 4.1138E-01 3.8798E-01 3.6668E-01 3.4728E-01 3.2958E-01

N = 1  X = WMM/WCR =  5.04000E-01  WT FLOW CALC =  6.79665E-02   D = -4.40320E-02


WSH =  6.87168E-01  WMH =  5.15991E-01  WPH =  4.13025E-01
WSM =  6.15975E-01  WMM =  4.54000E-01  WPM =  3.58186E-01
WST =  5.47478E-01  WMT =  3.95736E-01  WPT =  3.07531E-01

  A(IK)

5.6916E-01 5.4120E-01 5.1433E-01 4.8899E-01 4.6535E-01 4.4340E-01 4.2308E-01 4.0428E-01 3.8689E-01
5.3045E-01 4.9931E-01 4.7037E-01 4.4374E-01 4.1937E-01 3.9710E-01 3.7675E-01 3.5814E-01 3.4109E-01
4.8712E-01 4.5404E-01 4.2408E-01 3.9706E-01 3.7273E-01 3.5078E-01 3.3096E-01 3.1300E-01 2.9669E-01

N = 2  X = WMM/WCR =  4.54000E-01  WT FLOW CALC =  6.25614E-02   D =  3.89947E-02


WSH =  7.21937E-01  WMH =  5.42099E-01  WPH =  4.33924E-01
WSM =  6.49895E-01  WMM =  4.79000E-01  WPM =  3.77910E-01
WST =  5.80684E-01  WMT =  4.19738E-01  WPT =  3.26184E-01

  A(IK)
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5.8555E-01 5.5871E-01 5.3238E-01 5.0720E-01 4.8348E-01 4.6130E-01 4.4065E-01 4.2146E-01 4.0365E-01
5.4974E-01 5.1905E-01 4.9009E-01 4.6319E-01 4.3839E-01 4.1560E-01 3.9468E-01 3.7549E-01 3.5785E-01
5.0883E-01 4.7557E-01 4.4510E-01 4.1741E-01 3.9232E-01 3.6960E-01 3.4900E-01 3.3029E-01 3.1326E-01

N = 3 X = WMM/WCR = 4.79000E-01 WT FLOW CALC = 6.53181E-02 D = -3.35041E-03

WSH = 7.19136E-01 WMH = 5.39995E-01 WPH = 4.32240E-01
WSM = 6.47162E-01 WMM = 4.76986E-01 WPM = 3.76320E-01
WST = 5.78008E-01 WMT = 4.17804E-01 WPT = 3.24681E-01

A(IK)

5.8429E-01 5.5735E-01 5.3096E-01 5.0577E-01 4.8204E-01 4.5988E-01 4.3925E-01 4.2010E-01 4.0232E-01
5.4824E-01 5.1750E-01 4.8854E-01 4.6165E-01 4.3688E-01 4.1413E-01 3.9326E-01 3.7411E-01 3.5652E-01
5.0713E-01 4.7387E-01 4.4343E-01 4.1579E-01 3.9076E-01 3.6810E-01 3.4756E-01 3.2891E-01 3.1193E-01

N = 4 X = WMM/WCR = 4.76986E-01 WT FLOW CALC = 6.50999E-02 D = 9.90927E-07

THIRD STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	5.96000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.99610E 02	0.00000E-39	2.00200E-01
MEAN	6.33000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.99610E 02		
TIP	6.71000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.99610E 02	0.00000E-39	2.24800E-01

	BETA		
HUB	4.30000E 01	4.30000E 01	4.30000E 01
MEAN	4.30000E 01	4.30000E 01	4.30000E 01
TIP	4.30000E 01	4.30000E 01	4.30000E 01

ID1 = 0 ID2 = 0 X = 6.27000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 1 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.28687E 00 VSM = 1.30718E 00 VST = 1.32837E 00 VPH = 8.22054E-01

VPM = 8.12115E-01 VPT = 8.02032E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-2.32328E 00	1.71454E 03	-3.57205E-03
2	-2.28814E 00	1.71454E 03	-3.51802E-03
3	-2.25404E 00	1.71454E 03	-3.46559E-03
4	-2.22095E 00	1.71454E 03	-3.41470E-03
5	-2.18881E 00	1.71454E 03	-3.36529E-03
6	-2.15759E 00	1.71454E 03	-3.31729E-03
7	-2.12724E 00	1.71454E 03	-3.27064E-03
8	-2.09774E 00	1.71454E 03	-3.22528E-03
9	-2.06905E 00	1.71454E 03	-3.18116E-03

IK	M(IK)	N(IK)
1	2.77340E-02	1.66765E 03
2	2.06439E-02	1.67951E 03

```
3      1.36603E-02          1.69128E 03
4      6.78000E-03          1.70296E 03
5      0.00000E-39          1.71454E 03
6     -6.68258E-03          1.72604E 03
7     -1.32705E-02          1.73745E 03
8     -1.97664E-02          1.74877E 03
9     -2.61729E-02          1.76001E 03

 PH = -2.08020E 01   PM =  0.00000E-39   PT =  2.13699E 01

QH =  1.02812E 00   QM =  1.00000E 00   QT =  9.74167E-01


WSH =  8.74601E-01  WMH =  6.79634E-01  WPH =  5.58696E-01
WSM =  8.19600E-01  WMM =  6.27000E-01  WPM =  5.09196E-01
WST =  7.66113E-01  WMT =  5.76732E-01  WPT =  4.62558E-01

  A(IK)

6.3615E-01 6.2080E-01 6.0308E-01 5.8434E-01 5.6539E-01 5.4672E-01 5.2861E-01 5.1121E-01 4.9460E-01
6.2208E-01 6.0180E-01 5.8014E-01 5.5829E-01 5.3688E-01 5.1627E-01 4.9664E-01 4.7804E-01 4.6050E-01
6.0385E-01 5.7917E-01 5.5414E-01 5.2970E-01 5.0632E-01 4.8422E-01 4.6347E-01 4.4407E-01 4.2595E-01

N = 1  X = WMM/WCR =  6.27000E-01  WT FLOW CALC =  3.34715E-02   D = -4.92637E-02


WSH =  8.08448E-01  WMH =  6.28228E-01  WPH =  5.16437E-01
WSM =  7.54242E-01  WMM =  5.77000E-01  WPM =  4.68590E-01
WST =  7.01410E-01  WMT =  5.28624E-01  WPT =  4.23492E-01

  A(IK)

6.1865E-01 5.9900E-01 5.7839E-01 5.5775E-01 5.3759E-01 5.1820E-01 4.9973E-01 4.8221E-01 4.6566E-01
5.9922E-01 5.7546E-01 5.5166E-01 5.2855E-01 5.0649E-01 4.8564E-01 4.6605E-01 4.4771E-01 4.3054E-01
5.7608E-01 5.4879E-01 5.2235E-01 4.9729E-01 4.7380E-01 4.5192E-01 4.3161E-01 4.1279E-01 3.9534E-01

N = 2  X = WMM/WCR =  5.77000E-01  WT FLOW CALC =  3.16609E-02   D =  7.49628E-03


WSH =  8.41524E-01  WMH =  6.53931E-01  WPH =  5.37567E-01
WSM =  7.86921E-01  WMM =  6.02000E-01  WPM =  4.88893E-01
WST =  7.33762E-01  WMT =  5.52378E-01  WPT =  4.43025E-01

  A(IK)
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6.2827E-01 6.1063E-01 5.9134E-01 5.7156E-01 5.5193E-01 5.3284E-01 5.1450E-01 4.9709E-01 4.8038E-01
6.1147E-01 5.8930E-01 5.6646E-01 5.4388E-01 5.2208E-01 5.0129E-01 4.8163E-01 4.6312E-01 4.4574E-01
5.9073E-01 5.6459E-01 5.3875E-01 5.1391E-01 4.9040E-01 4.6836E-01 4.4779E-01 4.2864E-01 4.1082E-01

N = 3 X = WMM/WCR = 6.02000E-01 WT FLOW CALC = 3.25930E-02 D = -2.17256E-02

WSH = 8.16754E-01 WMH = 6.34682E-01 WPH = 5.21743E-01
WSM = 7.62448E-01 WMM = 5.83278E-01 WPM = 4.73689E-01
WST = 7.09534E-01 WMT = 5.34140E-01 WPT = 4.28397E-01

A(IK)

6.2122E-01 6.0205E-01 5.8176E-01 5.6131E-01 5.4127E-01 5.2195E-01 5.0350E-01 4.8598E-01 4.6941E-01
6.0244E-01 5.7906E-01 5.5548E-01 5.3249E-01 5.1048E-01 4.8963E-01 4.7002E-01 4.5162E-01 4.3440E-01
5.7990E-01 5.5287E-01 5.2656E-01 5.0154E-01 4.7803E-01 4.5610E-01 4.3572E-01 4.1681E-01 3.9926E-01

N = 4 X = WMM/WCR = 5.83278E-01 WT FLOW CALC = 3.18999E-02 D = 3.02494E-06

THIRD STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.05000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.96560E 02	0.00000E-39	2.00200E-01
MEAN	6.42000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.96560E 02		
TIP	6.81000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.96560E 02	0.00000E-39	2.24800E-01

	BETA		
HUB	3.00000E 01	3.00000E 01	3.00000E 01
MEAN	3.00000E 01	3.00000E 01	3.00000E 01
TIP	3.00000E 01	3.00000E 01	3.00000E 01

ID1 = 0 ID2 = 1 X = 6.21000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.29178E 00 VSM = 1.31217E 00 VST = 1.33400E 00 VPH = 8.19625E-01

VPM = 8.09715E-01 VPT = 7.99399E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-1.24875E 00	1.25700E 03	-1.91995E-03
2	-1.22986E 00	1.25700E 03	-1.89091E-03
3	-1.21153E 00	1.25700E 03	-1.86273E-03
4	-1.19374E 00	1.25700E 03	-1.83538E-03
5	-1.17647E 00	1.25700E 03	-1.80882E-03
6	-1.15969E 00	1.25700E 03	-1.78302E-03
7	-1.14338E 00	1.25700E 03	-1.75795E-03
8	-1.12752E 00	1.25700E 03	-1.73357E-03
9	-1.11210E 00	1.25700E 03	-1.70985E-03

IK	M(IK)	N(IK)
1	1.49068E-02	1.23840E 03
2	1.10960E-02	1.24313E 03

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3      7.34232E-03          1.24780E 03
4      3.64421E-03          1.25243E 03
5      0.00000E-39          1.25700E 03
6     -3.59184E-03          1.26152E 03
7     -7.13281E-03          1.26600E 03
8     -1.06243E-02          1.27043E 03
9     -1.40677E-02          1.27481E 03

 PH = -1.53476E 01   PM =  0.00000E-39   PT =  1.55714E 01

QH =  1.01592E 00   QM =  1.00000E 00   QT =  9.86031E-01


WSH =  8.47177E-01  WMH =  6.55821E-01  WPH =  5.37528E-01
WSM =  8.14855E-01  WMM =  6.21000E-01  WPM =  5.02833E-01
WST =  7.83322E-01  WMT =  5.87197E-01  WPT =  4.69405E-01

  A(IK)

6.2974E-01 6.1218E-01 5.9280E-01 5.7282E-01 5.5295E-01 5.3360E-01 5.1499E-01 4.9723E-01 4.8036E-01
6.2064E-01 5.9975E-01 5.7755E-01 5.5522E-01 5.3340E-01 5.1244E-01 4.9251E-01 4.7367E-01 4.5592E-01
6.1020E-01 5.8603E-01 5.6112E-01 5.3656E-01 5.1294E-01 4.9052E-01 4.6942E-01 4.4965E-01 4.3116E-01

N = 1  X = WMM/WCR =  6.21000E-01  WT FLOW CALC =  3.35135E-02   D = -5.05802E-02


WSH =  5.84941E-01  WMH =  4.52818E-01  WPH =  3.71141E-01
WSM =  5.52422E-01  WMM =  4.21000E-01  WPM =  3.40890E-01
WST =  5.20249E-01  WMT =  3.89991E-01  WPT =  3.11759E-01

  A(IK)

5.1152E-01 4.8528E-01 4.6107E-01 4.3884E-01 4.1845E-01 3.9974E-01 3.8256E-01 3.6673E-01 3.5214E-01
4.9043E-01 4.6267E-01 4.3735E-01 4.1431E-01 3.9333E-01 3.7422E-01 3.5677E-01 3.4080E-01 3.2615E-01
4.6835E-01 4.3928E-01 4.1303E-01 3.8935E-01 3.6796E-01 3.4861E-01 3.3105E-01 3.1506E-01 3.0047E-01

N = 2  X = WMM/WCR =  4.21000E-01  WT FLOW CALC =  2.49354E-02   D =  2.18327E-01


WSH =  7.16059E-01  WMH =  5.54319E-01  WPH =  4.54334E-01
WSM =  6.83638E-01  WMM =  5.21000E-01  WPM =  4.21862E-01
WST =  6.51785E-01  WMT =  4.88594E-01  WPT =  3.90582E-01

  A(IK)
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5.8290E-01 5.5881E-01 5.3533E-01 5.1289E-01 4.9170E-01 4.7181E-01 4.5321E-01 4.3584E-01 4.1963E-01
5.6741E-01 5.4083E-01 5.1535E-01 4.9133E-01 4.6888E-01 4.4801E-01 4.2864E-01 4.1068E-01 3.9403E-01
5.5077E-01 5.2183E-01 4.9451E-01 4.6906E-01 4.4552E-01 4.2382E-01 4.0383E-01 3.8542E-01 3.6845E-01

N = 3  X = WMM/WCR =  5.21000E-01  WT FLOW CALC =  2.96092E-02   D =  7.18108E-02


WSH =  7.89810E-01  WMH =  6.11412E-01  WPH =  5.01129E-01
WSM =  7.57445E-01  WMM =  5.77248E-01  WPM =  4.67406E-01
WST =  7.25772E-01  WMT =  5.44056E-01  WPT =  4.34918E-01

  A(IK)

6.1247E-01 5.9149E-01 5.6988E-01 5.4847E-01 5.2774E-01 5.0793E-01 4.8914E-01 4.7140E-01 4.5469E-01
6.0049E-01 5.7652E-01 5.5244E-01 5.2902E-01 5.0665E-01 4.8550E-01 4.6564E-01 4.4704E-01 4.2965E-01
5.8725E-01 5.6039E-01 5.3397E-01 5.0867E-01 4.8480E-01 4.6248E-01 4.4169E-01 4.2238E-01 4.0444E-01

N = 4  X = WMM/WCR =  5.77248E-01  WT FLOW CALC =  3.19079E-02   D = -2.46972E-04
```

THIRD STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.16000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.91670E 02	0.00000E-39	2.00200E-01
MEAN	6.54000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.91670E 02		
TIP	6.93000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.91670E 02	0.00000E-39	2.24800E-01

	BETA		
HUB	1.50000E 01	1.50000E 01	1.50000E 01
MEAN	1.50000E 01	1.50000E 01	1.50000E 01
TIP	1.50000E 01	1.50000E 01	1.50000E 01

ID1 = 0 ID2 = 2 X = 6.14000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.29781E 00 VSM = 1.31885E 00 VST = 1.34079E 00 VPH = 8.16666E-01

VPM = 8.06527E-01 VPT = 7.96252E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.34602E-01	6.50671E 02	-5.14450E-04
2	-3.29540E-01	6.50671E 02	-5.06668E-04
3	-3.24629E-01	6.50671E 02	-4.99118E-04
4	-3.19863E-01	6.50671E 02	-4.91789E-04
5	-3.15234E-01	6.50671E 02	-4.84673E-04
6	-3.10738E-01	6.50671E 02	-4.77759E-04
7	-3.06368E-01	6.50671E 02	-4.71040E-04
8	-3.02119E-01	6.50671E 02	-4.64508E-04
9	-2.97986E-01	6.50671E 02	-4.58154E-04

IK	M(IK)	N(IK)
1	3.99427E-03	6.48077E 02
2	2.97315E-03	6.48739E 02

```
3      1.96737E-03          6.49392E 02
4      9.76462E-04          6.50036E 02
5      0.00000E-39          6.50671E 02
6     -9.62432E-04          6.51298E 02
7     -1.91123E-03          6.51916E 02
8     -2.84678E-03          6.52526E 02
9     -3.76944E-03          6.53128E 02

 PH = -7.98745E 00   PM =  0.00000E-39   PT =  8.01859E 00

QH =  1.00400E 00   QM =  1.00000E 00   QT =  9.96238E-01


WSH =  8.17076E-01  WMH =  6.29582E-01  WPH =  5.14158E-01
WSM =  8.09771E-01  WMM =  6.14000E-01  WPM =  4.95208E-01
WST =  8.02620E-01  WMT =  5.98616E-01  WPT =  4.76649E-01

  A(IK)

6.2132E-01 6.0147E-01 5.8040E-01 5.5916E-01 5.3837E-01 5.1834E-01 4.9924E-01 4.8114E-01 4.6404E-01
6.1906E-01 5.9743E-01 5.7455E-01 5.5162E-01 5.2928E-01 5.0788E-01 4.8756E-01 4.6840E-01 4.5038E-01
6.1677E-01 5.9329E-01 5.6856E-01 5.4391E-01 5.2081E-01 4.9723E-01 4.7573E-01 4.5553E-01 4.3663E-01

N = 1  X = WMM/WCR =  6.14000E-01  WT FLOW CALC =  3.34835E-02   D = -4.96400E-02


WSH =  7.51926E-01  WMH =  5.79382E-01  WPH =  4.73162E-01
WSM =  7.43829E-01  WMM =  5.64000E-01  WPM =  4.54881E-01
WST =  7.35833E-01  WMT =  5.48804E-01  WPT =  4.36986E-01

  A(IK)

5.9829E-01 5.7519E-01 5.5194E-01 5.2946E-01 5.0801E-01 4.8772E-01 4.6864E-01 4.5075E-01 4.3400E-01
5.9498E-01 5.6994E-01 5.4502E-01 5.2095E-01 4.9809E-01 4.7656E-01 4.5641E-01 4.3759E-01 4.2005E-01
5.9162E-01 5.6467E-01 5.3796E-01 5.1229E-01 4.8801E-01 4.6527E-01 4.4407E-01 4.2437E-01 4.0607E-01

N = 2  X = WMM/WCR =  5.64000E-01  WT FLOW CALC =  3.15970E-02   D =  9.49918E-03


WSH =  7.84501E-01  WMH =  6.04482E-01  WPH =  4.93660E-01
WSM =  7.76800E-01  WMM =  5.89000E-01  WPM =  4.75044E-01
WST =  7.69227E-01  WMT =  5.73710E-01  WPT =  4.56818E-01

  A(IK)
```

6.1061E-01 5.8895E-01 5.6672E-01 5.4478E-01 5.2358E-01 5.0337E-01 4.8423E-01 4.6620E-01 4.4924E-01
6.0784E-01 5.8435E-01 5.6034E-01 5.3675E-01 5.1407E-01 4.9254E-01 4.7226E-01 4.5323E-01 4.3542E-01
6.0503E-01 5.7965E-01 5.5381E-01 5.2854E-01 5.0438E-01 4.8156E-01 4.6016E-01 4.4017E-01 4.2154E-01

N = 3 X = WMM/WCR = 5.89000E-01 WT FLOW CALC = 3.25671E-02 D = -2.09134E-02

WSH = 7.61909E-01 WMH = 5.87074E-01 WPH = 4.79443E-01
WSM = 7.53933E-01 WMM = 5.71661E-01 WPM = 4.61660E-01
WST = 7.46067E-01 WMT = 5.56437E-01 WPT = 4.43064E-01

A(IK)

6.0223E-01 5.7949E-01 5.5658E-01 5.3425E-01 5.1286E-01 4.9259E-01 4.7348E-01 4.5554E-01 4.3872E-01
5.9909E-01 5.7450E-01 5.4983E-01 5.2589E-01 5.0306E-01 4.8153E-01 4.6133E-01 4.4244E-01 4.2480E-01
5.9590E-01 5.6940E-01 5.4293E-01 5.1736E-01 4.9310E-01 4.7032E-01 4.4906E-01 4.2926E-01 4.1085E-01

N = 4 X = WMM/WCR = 5.71661E-01 WT FLOW CALC = 3.18999E-02 D = 3.40492E-06

THIRD STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.28000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.88620E 02	0.00000E-39	2.09200E-01
MEAN	6.67000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.88620E 02		
TIP	7.07000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.88620E 02	0.00000E-39	2.24800E-01

	BETA		
HUB	5.00000E 00	5.00000E 00	5.00000E 00
MEAN	5.00000E 00	5.00000E 00	5.00000E 00
TIP	5.00000E 00	5.00000E 00	5.00000E 00

ID1 = 0 ID2 = 3 X = 6.07000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.30441E 00 VSM = 1.32612E 00 VST = 1.34876E 00 VPH = 8.13451E-01

VPM = 8.03087E-01 VPT = 7.92595E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.79427E-02	2.19110E 02	-5.83368E-05
2	-3.73687E-02	2.19110E 02	-5.74544E-05
3	-3.68118E-02	2.19110E 02	-5.65982E-05
4	-3.62713E-02	2.19110E 02	-5.57672E-05
5	-3.57465E-02	2.19110E 02	-5.49602E-05
6	-3.52366E-02	2.19110E 02	-5.41762E-05
7	-3.47410E-02	2.19110E 02	-5.34143E-05
8	-3.42592E-02	2.19110E 02	-5.26735E-05
9	-3.37906E-02	2.19110E 02	-5.19530E-05

IK	M(IK)	N(IK)
1	4.52936E-04	2.19010E 02
2	3.37145E-04	2.19036E 02

```
 3      2.23093E-04          2.19061E 02
 4      1.10727E-04          2.19085E 02
 5      0.00000E-39          2.19110E 02
 6     -1.09136E-04          2.19133E 02
 7     -2.16727E-04          2.19157E 02
 8     -3.22815E-04          2.19180E 02
 9     -4.27441E-04          2.19203E 02

  PH = -2.69444E 00   PM =  0.00000E-39   PT =  2.69563E 00

QH =  1.00045E 00   QM =  1.00000E 00   QT =  9.99573E-01


WSH =  7.97893E-01  WMH =  6.11687E-01  WPH =  4.97577E-01
WSM =  8.04956E-01  WMM =  6.07000E-01  WPM =  4.87474E-01
WST =  8.12400E-01  WMT =  6.02331E-01  WPT =  4.77404E-01

  A(IK)

6.1521E-01 5.9383E-01 5.7156E-01 5.4941E-01 5.2791E-01 5.0734E-01 4.8783E-01 4.6943E-01 4.5211E-01
6.1753E-01 5.9513E-01 5.7155E-01 5.4799E-01 5.2510E-01 5.0322E-01 4.8250E-01 4.6300E-01 4.4469E-01
6.1989E-01 5.9651E-01 5.7160E-01 5.4659E-01 5.2228E-01 4.9906E-01 4.7711E-01 4.5649E-01 4.3719E-01

N = 1  X = WMM/WCR =  6.07000E-01  WT FLOW CALC =  3.36382E-02   D = -5.44881E-02


WSH =  5.36892E-01  WMH =  4.11596E-01  WPH =  3.34813E-01
WSM =  5.39731E-01  WMM =  4.07000E-01  WPM =  3.26857E-01
WST =  5.42763E-01  WMT =  4.02416E-01  WPT =  3.18953E-01

  A(IK)

4.7992E-01 4.5289E-01 4.2832E-01 4.0601E-01 3.8573E-01 3.6727E-01 3.5041E-01 3.3499E-01 3.2084E-01
4.8186E-01 4.5314E-01 4.2706E-01 4.0342E-01 3.8198E-01 3.6252E-01 3.4481E-01 3.2864E-01 3.1385E-01
4.8393E-01 4.5347E-01 4.2583E-01 4.0083E-01 3.7823E-01 3.5776E-01 3.3919E-01 3.2229E-01 3.0686E-01

N = 2  X = WMM/WCR =  4.07000E-01  WT FLOW CALC =  2.47068E-02   D =  2.25493E-01


WSH =  6.67393E-01  WMH =  5.11641E-01  WPH =  4.16195E-01
WSM =  6.72344E-01  WMM =  5.07000E-01  WPM =  4.07165E-01
WST =  6.77581E-01  WMT =  5.02374E-01  WPT =  3.98179E-01

  A(IK)
```

```
5.5909E-01 5.3274E-01 5.0767E-01 4.8415E-01 4.6225E-01 4.4193E-01 4.2309E-01 4.0564E-01 3.8946E-01
5.6166E-01 5.3375E-01 5.0714E-01 4.8216E-01 4.5893E-01 4.3741E-01 4.1751E-01 3.9912E-01 3.8212E-01
5.6435E-01 5.3486E-01 5.0666E-01 4.8019E-01 4.5559E-01 4.3286E-01 4.1189E-01 3.9256E-01 3.7474E-01

N = 3  X = WMM/WCR =  5.07000E-01  WT FLOW CALC =  2.95583E-02   D =  7.34068E-02


WSH =  7.39241E-01  WMH =  5.66722E-01  WPH =  4.61001E-01
WSM =  7.45355E-01  WMM =  5.62056E-01  WPM =  4.51380E-01
WST =  7.51807E-01  WMT =  5.57406E-01  WPT =  4.41797E-01

  A(IK)

5.9306E-01 5.6888E-01 5.4492E-01 5.2181E-01 4.9986E-01 4.7919E-01 4.5981E-01 4.4168E-01 4.2476E-01
5.9561E-01 5.7012E-01 5.4470E-01 5.2014E-01 4.9681E-01 4.7487E-01 4.5433E-01 4.3518E-01 4.1734E-01
5.9824E-01 5.7145E-01 5.4454E-01 5.1849E-01 4.9375E-01 4.7050E-01 4.4881E-01 4.2862E-01 4.0986E-01

N = 4  X = WMM/WCR =  5.62056E-01  WT FLOW CALC =  3.19082E-02   D = -2.56196E-04
```

THIRD STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.32000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.86780E 02	0.00000E-39	2.00200E-01
MEAN	6.71000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.86780E 02		
TIP	7.11000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.86780E 02	0.00000E-39	2.24800E-01

	BETA		
HUB	0.00000E-39	0.00000E-39	0.00000E-39
MEAN	0.00000E-39	0.00000E-39	0.00000E-39
TIP	0.00000E-39	0.00000E-39	0.00000E-39

ID1 = 0 ID2 = 4 X = 6.04000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.30662E 00 VSM = 1.32837E 00 VST = 1.35104E 00 VPH = 8.12382E-01

VPM = 8.02032E-01 VPT = 7.91553E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-0.00000E-39	0.00000E-39	-0.00000E-39
2	-0.00000E-39	0.00000E-39	-0.00000E-39
3	-0.00000E-39	0.00000E-39	-0.00000E-39
4	-0.00000E-39	0.00000E-39	-0.00000E-39
5	-0.00000E-39	0.00000E-39	-0.00000E-39
6	-0.00000E-39	0.00000E-39	-0.00000E-39
7	-0.00000E-39	0.00000E-39	-0.00000E-39
8	-0.00000E-39	0.00000E-39	-0.00000E-39
9	-0.00000E-39	0.00000E-39	-0.00000E-39

IK	M(IK)	N(IK)
1	0.00000E-39	0.00000E-39
2	0.00000E-39	0.00000E-39

```
3      0.000000E-39          0.000000E-39
4      0.000000E-39          0.000000E-39
5      0.000000E-39          0.000000E-39
6     -0.000000E-39          0.000000E-39
7     -0.000000E-39          0.000000E-39
8     -0.000000E-39          0.000000E-39
9     -0.000000E-39          0.000000E-39

 PH = -0.000000E-39   PM =  0.000000E-39   PT =  0.000000E-39

QH =  1.000000E 00   QM =  1.000000E 00   QT =  1.000000E 00


WSH =  7.89201E-01  WMH =  6.04000E-01  WPH =  4.90679E-01
WSM =  8.02334E-01  WMM =  6.04000E-01  WPM =  4.84427E-01
WST =  8.16031E-01  WMT =  6.04000E-01  WPT =  4.78098E-01

  A(IK)

6.1226E-01 5.9025E-01 5.6753E-01 5.4504E-01 5.2329E-01 5.0255E-01 4.8292E-01 4.6443E-01 4.4705E-01
6.1668E-01 5.9398E-01 5.7014E-01 5.4636E-01 5.2329E-01 5.0126E-01 4.8042E-01 4.6082E-01 4.4243E-01
6.2100E-01 5.9773E-01 5.7280E-01 5.4772E-01 5.2329E-01 4.9995E-01 4.7787E-01 4.5713E-01 4.3771E-01

 = 1  X = WMM/WCR =  6.040000E-01  WT FLOW CALC =  3.35729E-02   D = -5.24413E-02

SH =  5.27876E-01  WMH =  4.04000E-01  WPH =  3.28202E-01
SM =  5.36661E-01  WMM =  4.04000E-01  WPM =  3.24021E-01
ST =  5.45822E-01  WMT =  4.04000E-01  WPT =  3.19788E-01

  A(IK)

.7369E-01 4.4659E-01 4.2201E-01 3.9974E-01 3.7953E-01 3.6115E-01 3.4440E-01 3.2908E-01 3.1504E-01
.7976E-01 4.5090E-01 4.2472E-01 4.0101E-01 3.7953E-01 3.6004E-01 3.4231E-01 3.2614E-01 3.1135E-01
.8600E-01 4.5534E-01 4.2750E-01 4.0231E-01 3.7953E-01 3.5890E-01 3.4018E-01 3.2314E-01 3.0760E-01

 = 2  X = WMM/WCR =  4.040000E-01  WT FLOW CALC =  2.45885E-02   D =  2.29201E-01

SH =  6.58539E-01  WMH =  5.04000E-01  WPH =  4.09440E-01
SM =  6.69497E-01  WMM =  5.04000E-01  WPM =  4.04224E-01
ST =  6.80927E-01  WMT =  5.04000E-01  WPT =  3.98943E-01

  A(IK)
```

```
5.5441E-01 5.2771E-01 5.0241E-01 4.7875E-01 4.5677E-01 4.3640E-01 4.1756E-01 4.0012E-01 3.8398E-01
5.6019E-01 5.3204E-01 5.0524E-01 4.8012E-01 4.5677E-01 4.3516E-01 4.1519E-01 3.9675E-01 3.7971E-01
5.6604E-01 5.3647E-01 5.0814E-01 4.8152E-01 4.5677E-01 4.3388E-01 4.1277E-01 3.9331E-01 3.7537E-01

N = 3  X = WMM/WCR =  5.04000E-01  WT FLOW CALC =  2.94656E-02   D =  7.63139E-02


WSH =  7.32982E-01  WMH =  5.60973E-01  WPH =  4.55724E-01
WSM =  7.45179E-01  WMM =  5.60973E-01  WPM =  4.49918E-01
WST =  7.57900E-01  WMT =  5.60973E-01  WPT =  4.44040E-01

  A(IK)

5.9039E-01 5.6581E-01 5.4154E-01 5.1822E-01 4.9610E-01 4.7530E-01 4.5584E-01 4.3766E-01 4.2070E-01
5.9554E-01 5.6988E-01 5.4429E-01 5.1957E-01 4.9610E-01 4.7403E-01 4.5338E-01 4.3413E-01 4.1620E-01
6.0067E-01 5.7401E-01 5.4710E-01 5.2097E-01 4.9610E-01 4.7271E-01 4.5087E-01 4.3052E-01 4.1162E-01

N = 4  X = WMM/WCR =  5.60973E-01  WT FLOW CALC =  3.19082E-02   D = -2.58133E-04
```

THIRD STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.36000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.84950E 02	0.00000E-39	2.00200E-01
MEAN	6.75000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.84950E 02		
TIP	7.16000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.84950E 02	0.00000E-39	2.24800E-01

	BETA		
HUB	5.00000E 00	5.00000E 00	5.00000E 00
MEAN	5.00000E 00	5.00000E 00	5.00000E 00
TIP	5.00000E 00	5.00000E 00	5.00000E 00

ID1 = 0 ID2 = 5 X = 6.81000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.30884E 00 VSM = 1.33062E 00 VST = 1.35391E 00 VPH = 8.11314E-01

VPM = 8.00978E-01 VPT = 7.90253E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.79427E-02	2.19110E 02	-5.83368E-05
2	-3.73687E-02	2.19110E 02	-5.74544E-05
3	-3.68118E-02	2.19110E 02	-5.65982E-05
4	-3.62713E-02	2.19110E 02	-5.57672E-05
5	-3.57465E-02	2.19110E 02	-5.49602E-05
6	-3.52366E-02	2.19110E 02	-5.41762E-05
7	-3.47410E-02	2.19110E 02	-5.34143E-05
8	-3.42592E-02	2.19110E 02	-5.26735E-05
9	-3.37906E-02	2.19110E 02	-5.19530E-05

IK	M(IK)	N(IK)
1	4.52936E-04	2.19010E 02
2	3.37145E-04	2.19036E 02

```
3      2.23093E-04          2.19061E 02
4      1.10727E-04          2.19085E 02
5      0.00000E-39          2.19110E 02
6     -1.09136E-04          2.19133E 02
7     -2.16727E-04          2.19157E 02
8     -3.22815E-04          2.19180E 02
9     -4.27441E-04          2.19203E 02

 PH = -2.69444E 00   PM =  0.00000E-39   PT =  2.69563E 00

 QH =  1.00045E 00   QM =  1.00000E 00   QT =  9.99573E-01


 WSH =  7.92742E-01  WMH =  6.05684E-01  WPH =  4.91400E-01
 WSM =  7.99702E-01  WMM =  6.01000E-01  WPM =  4.81388E-01
 WST =  8.07380E-01  WMT =  5.96333E-01  WPT =  4.71254E-01

   A(IK)

6.1348E-01 5.9151E-01 5.6875E-01 5.4617E-01 5.2431E-01 5.0344E-01 4.8369E-01 4.6507E-01 4.4759E-01
6.1581E-01 5.9281E-01 5.6871E-01 5.4472E-01 5.2147E-01 4.9929E-01 4.7834E-01 4.5864E-01 4.4017E-01
6.1831E-01 5.9428E-01 5.6880E-01 5.4332E-01 5.1861E-01 4.9507E-01 4.7286E-01 4.5203E-01 4.3256E-01

N = 1  X = WMM/WCR =  6.01000E-01  WT FLOW CALC =  3.35074E-02   D = -5.03873E-02


WSH =  5.30856E-01  WMH =  4.05593E-01  WPH =  3.29064E-01
WSM =  5.33578E-01  WMM =  4.01000E-01  WPM =  3.21192E-01
WST =  5.36714E-01  WMT =  3.96419E-01  WPT =  3.13271E-01

  A(IK)

4.7576E-01 4.4846E-01 4.2368E-01 4.0122E-01 3.8083E-01 3.6230E-01 3.4540E-01 3.2996E-01 3.1579E-01
4.7764E-01 4.4865E-01 4.2237E-01 3.9859E-01 3.7707E-01 3.5755E-01 3.3981E-01 3.2363E-01 3.0885E-01
4.7980E-01 4.4902E-01 4.2116E-01 3.9600E-01 3.7329E-01 3.5276E-01 3.3414E-01 3.1723E-01 3.0181E-01

N = 2  X = WMM/WCR =  4.01000E-01  WT FLOW CALC =  2.44652E-02   D =  2.33067E-01


WSH =  6.61799E-01  WMH =  5.05639E-01  WPH =  4.10232E-01
WSM =  6.66640E-01  WMM =  5.01000E-01  WPM =  4.01290E-01
WST =  6.72047E-01  WMT =  4.96376E-01  WPT =  3.92263E-01

  A(IK)
```

```
3      2.23093E-04          2.19061E 02
4      1.10727E-04          2.19085E 02
5      0.00000E-39          2.19110E 02
6     -1.09136E-04          2.19133E 02
7     -2.16727E-04          2.19157E 02
8     -3.22815E-04          2.19180E 02
9     -4.27441E-04          2.19203E 02

 PH = -2.69444E 00   PM =  0.00000E-39   PT =  2.69563E 00

QH =  1.00045E 00   QM =  1.00000E 00   QT =  9.99573E-01


WSH =  7.92742E-01  WMH =  6.05684E-01  WPH =  4.91400E-01
WSM =  7.99702E-01  WMM =  6.01000E-01  WPM =  4.81388E-01
WST =  8.07380E-01  WMT =  5.96333E-01  WPT =  4.71254E-01

  A(IK)

6.1348E-01 5.9151E-01 5.6875E-01 5.4617E-01 5.2431E-01 5.0344E-01 4.8369E-01 4.6507E-01 4.4759E-01
6.1581E-01 5.9281E-01 5.6871E-01 5.4472E-01 5.2147E-01 4.9929E-01 4.7834E-01 4.5864E-01 4.4017E-01
6.1831E-01 5.9428E-01 5.6880E-01 5.4332E-01 5.1861E-01 4.9507E-01 4.7286E-01 4.5203E-01 4.3256E-01

N = 1  X = WMM/WCR =  6.01000E-01  WT FLOW CALC =  3.35074E-02   D = -5.03873E-02


WSH =  5.30856E-01  WMH =  4.05593E-01  WPH =  3.29064E-01
WSM =  5.33578E-01  WMM =  4.01000E-01  WPM =  3.21192E-01
WST =  5.36714E-01  WMT =  3.96419E-01  WPT =  3.13271E-01

  A(IK)

4.7576E-01 4.4846E-01 4.2368E-01 4.0122E-01 3.8083E-01 3.6230E-01 3.4540E-01 3.2996E-01 3.1579E-01
4.7764E-01 4.4865E-01 4.2237E-01 3.9859E-01 3.7707E-01 3.5755E-01 3.3981E-01 3.2363E-01 3.0885E-01
4.7980E-01 4.4902E-01 4.2116E-01 3.9600E-01 3.7329E-01 3.5276E-01 3.3414E-01 3.1723E-01 3.0181E-01

N = 2  X = WMM/WCR =  4.01000E-01  WT FLOW CALC =  2.44652E-02   D =  2.33067E-01


WSH =  6.61799E-01  WMH =  5.05639E-01  WPH =  4.10232E-01
WSM =  6.66640E-01  WMM =  5.01000E-01  WPM =  4.01290E-01
WST =  6.72047E-01  WMT =  4.96376E-01  WPT =  3.92263E-01

  A(IK)
```

```
5.5615E-01 5.2933E-01 5.0390E-01 4.8009E-01 4.5795E-01 4.3743E-01 4.1845E-01 4.0089E-01 3.8462E-01
5.5870E-01 5.3032E-01 5.0333E-01 4.7806E-01 4.5468E-01 4.3290E-01 4.1287E-01 3.9438E-01 3.7731E-01
5.6151E-01 5.3150E-01 5.0288E-01 4.7608E-01 4.5123E-01 4.2830E-01 4.0718E-01 3.8775E-01 3.6985E-01

N = 3  X = WMM/WCR =  5.01060E-01  WT FLOW CALC =  2.93702E-02   D =  7.93050E-02


WSH =  7.38928E-01  WMH =  5.64568E-01  WPH =  4.58042E-01
WSM =  7.45016E-01  WMM =  5.59902E-01  WPM =  4.48469E-01
WST =  7.51761E-01  WMT =  5.55253E-01  WPT =  4.38791E-01

  A(IK)

5.9293E-01 5.6841E-01 5.4412E-01 5.2070E-01 4.9846E-01 4.7752E-01 4.5791E-01 4.3959E-01 4.2249E-01
5.9547E-01 5.6964E-01 5.4389E-01 5.1901E-01 4.9539E-01 4.7319E-01 4.5244E-01 4.3309E-01 4.1508E-01
5.9822E-01 5.7107E-01 5.4379E-01 5.1738E-01 4.9232E-01 4.6879E-01 4.4684E-01 4.2644E-01 4.0750E-01

N = 4  X = WMM/WCR =  5.59902E-01  WT FLOW CALC =  3.19083E-02   D = -2.59399E-04
```

THIRD STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.48000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.81890E 02	0.00000E-39	2.00200E-01
MEAN	6.88000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.81890E 02		
TIP	7.29000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.81890E 02	0.00000E-39	2.24800E-01

	BETA		
HUB	1.50000E 01	1.50000E 01	1.50000E 01
MEAN	1.50000E 01	1.50000E 01	1.50000E 01
TIP	1.50000E 01	1.50000E 01	1.50000E 01

ID1 = 0 ID2 = 6 X = 5.96000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.31550E 00 VSM = 1.33796E 00 VST = 1.36138E 00 VPH = 8.08120E-01

VPM = 7.97562E-01 VPT = 7.86883E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.34602E-01	6.50671E 02	-5.14450E-04
2	-3.29540E-01	6.50671E 02	-5.06668E-04
3	-3.24629E-01	6.50671E 02	-4.99118E-04
4	-3.19863E-01	6.50671E 02	-4.91789E-04
5	-3.15234E-01	6.50671E 02	-4.84673E-04
6	-3.10738E-01	6.50671E 02	-4.77759E-04
7	-3.06368E-01	6.50671E 02	-4.71040E-04
8	-3.02119E-01	6.50671E 02	-4.64508E-04
9	-2.97986E-01	6.50671E 02	-4.58154E-04

IK	M(IK)	N(IK)
1	3.99427E-03	6.48077E 02
2	2.97315E-03	6.48739E 02

```
3      1.96737E-03          6.49392E 02
4      9.76462E-04          6.50036E 02
5      0.00000E-39          6.50671E 02
6     -9.62432E-04          6.51298E 02
7     -1.91123E-03          6.51916E 02
8     -2.84678E-03          6.52526E 02
9     -3.76944E-03          6.53128E 02

 PH = -7.98745E 00   PM =  0.00000E-39   PT =  8.01850E 00

QH =  1.00400E 00   QM =  1.00000E 00   QT =  9.96238E-01

WSH =  8.04442E-01  WMH =  6.11510E-01  WPH =  4.94173E-01
WSM =  7.97423E-01  WMM =  5.96000E-01  WPM =  4.75347E-01
WST =  7.90529E-01  WMT =  5.80684E-01  WPT =  4.56930E-01

  A(IK)

6.1736E-01 5.9562E-01 5.7279E-01 5.4998E-01 5.2780E-01 5.0658E-01 4.8645E-01 4.6747E-01 4.4962E-01
5.1506E-01 5.9144E-01 5.6673E-01 5.4216E-01 5.1841E-01 4.9578E-01 4.7444E-01 4.5440E-01 4.3565E-01
5.1272E-01 5.8715E-01 5.6052E-01 5.3418E-01 5.0884E-01 4.8483E-01 4.6229E-01 4.4124E-01 4.2163E-01

 = 1  X = WMM/WCR =  5.96000E-01  WT FLOW CALC =  3.36755E-02   D = -5.56577E-02

SH =  5.40289E-01  WMH =  4.10709E-01  WPH =  3.31902E-01
SM =  5.29832E-01  WMM =  3.96000E-01  WPM =  3.15834E-01
ST =  5.19278E-01  WMT =  3.81437E-01  WPT =  3.00146E-01

  A(IK)

.8224E-01 4.5433E-01 4.2895E-01 4.0592E-01 3.8501E-01 3.6599E-01 3.4865E-01 3.3281E-01 3.1829E-01
.7505E-01 4.4555E-01 4.1885E-01 3.9474E-01 3.7295E-01 3.5321E-01 3.3530E-01 3.1899E-01 3.0410E-01
.6767E-01 4.3659E-01 4.0860E-01 3.8345E-01 3.6082E-01 3.4042E-01 3.2198E-01 3.0527E-01 2.9006E-01

 = 2  X = WMM/WCR =  3.96000E-01  WT FLOW CALC =  2.44640E-02   D =  2.33104E-01

SH =  6.72365E-01  WMH =  5.11110E-01  WPH =  4.13038E-01
SM =  6.63628E-01  WMM =  4.96000E-01  WPM =  3.95591E-01
ST =  6.54904E-01  WMT =  4.81060E-01  WPT =  3.78538E-01

  A(IK)
```

5.6167E-01 5.3457E-01 5.0874E-01 4.8447E-01 4.6187E-01 4.4091E-01 4.2150E-01 4.0354E-01 3.8690E-01
5.5711E-01 5.2811E-01 5.0057E-01 4.7483E-01 4.5096E-01 4.2892E-01 4.0860E-01 3.8988E-01 3.7261E-01
5.5246E-01 5.2151E-01 4.9226E-01 4.6504E-01 4.3993E-01 4.1685E-01 3.9567E-01 3.7623E-01 3.5838E-01

N = 3 X = WMM/WCR = 4.96000E-01 WT FLOW CALC = 2.94559E-02 D = 7.66188E-02

WSH = 7.45886E-01 WMH = 5.66997E-01 WPH = 4.58202E-01
WSM = 7.38105E-01 WMM = 5.51665E-01 WPM = 4.39987E-01
WST = 7.30399E-01 WMT = 5.36516E-01 WPT = 4.22175E-01

A(IK)

5.9583E-01 5.7112E-01 5.4650E-01 5.2269E-01 5.0004E-01 4.7871E-01 4.5872E-01 4.4004E-01 4.2261E-01
5.9258E-01 5.6594E-01 5.3948E-01 5.1402E-01 4.8993E-01 4.6733E-01 4.4626E-01 4.2665E-01 4.0844E-01
5.8928E-01 5.6064E-01 5.3233E-01 5.0521E-01 4.7966E-01 4.5583E-01 4.3371E-01 4.1323E-01 3.9428E-01

N = 4 X = WMM/WCR = 5.51665E-01 WT FLOW CALC = 3.19084E-02 D = -2.64227E-04

THIRD STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.59000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.77620E 02	0.00000E-39	2.00200E-01
MEAN	7.00000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.77620E 02		
TIP	7.42000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.77620E 02	0.00000E-39	2.24800E-01

	BETA		
HUB	3.00000E 01	3.00000E 01	3.00000E 01
MEAN	3.00000E 01	3.00000E 01	3.00000E 01
TIP	3.00000E 01	3.00000E 01	3.00000E 01

ID1 = 0 ID2 = 7 X = 5.88000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.32164E 00 VSM = 1.34477E 00 VST = 1.36889E 00 VPH = 8.05202E-01

VPM = 7.94421E-01 VPT = 7.83527E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-1.24875E 00	1.25700E 03	-1.91995E-03
2	-1.22986E 00	1.25700E 03	-1.89091E-03
3	-1.21153E 00	1.25700E 03	-1.86273E-03
4	-1.19374E 00	1.25700E 03	-1.83538E-03
5	-1.17647E 00	1.25700E 03	-1.80882E-03
6	-1.15969E 00	1.25700E 03	-1.78302E-03
7	-1.14338E 00	1.25700E 03	-1.75795E-03
8	-1.12752E 00	1.25700E 03	-1.73357E-03
9	-1.11210E 00	1.25700E 03	-1.70985E-03

IK	M(IK)	N(IK)
1	1.49068E-02	1.23840E 03
2	1.10960E-02	1.24313E 03

```
3      7.34232E-03          1.24780E 03
4      3.64421E-03          1.25243E 03
5      0.00000E-39          1.25700E 03
6     -3.59184E-03          1.26152E 03
7     -7.13281E-03          1.26600E 03
8     -1.06243E-02          1.27043E 03
9     -1.40677E-02          1.27481E 03

 PH = -1.53476E 01   PM =  0.00000E-39   PT =  1.55714E 01

QH =  1.01502E 00   QM =  1.00000E 00   QT =  9.86031E-01


WSH =  8.22490E-01  WMH =  6.22326E-01  WPH =  5.01098E-01
WSM =  7.90725E-01  WMM =  5.88000E-01  WPM =  4.67128E-01
WST =  7.59263E-01  WMT =  5.54658E-01  WPT =  4.34590E-01

  A(IK)

6.2294E-01 6.0193E-01 5.7936E-01 5.5654E-01 5.3418E-01 5.1267E-01 4.9221E-01 4.7287E-01 4.5467E-01
6.1279E-01 5.8832E-01 5.6289E-01 5.3771E-01 5.1344E-01 4.9040E-01 4.6871E-01 4.4840E-01 4.2943E-01
6.0120E-01 5.7339E-01 5.4524E-01 5.1790E-01 4.9192E-01 4.6755E-01 4.4483E-01 4.2374E-01 4.0418E-01

N = 1  X = WMM/WCR =  5.88000E-01  WT FLOW CALC =  3.35516E-02   D = -5.17739E-02


WSH =  5.54192E-01  WMH =  4.19322E-01  WPH =  3.37639E-01
WSM =  5.21771E-01  WMM =  3.88000E-01  WPM =  3.08235E-01
WST =  4.89311E-01  WMT =  3.57452E-01  WPT =  2.80073E-01

  A(IK)

4.9161E-01 4.6311E-01 4.3712E-01 4.1348E-01 3.9198E-01 3.7242E-01 3.5457E-01 3.3826E-01 3.2331E-01
4.6942E-01 4.3952E-01 4.1255E-01 3.8823E-01 3.6631E-01 3.4649E-01 3.2853E-01 3.1220E-01 2.9732E-01
4.4605E-01 4.1503E-01 3.8733E-01 3.6260E-01 3.4046E-01 3.2060E-01 3.0271E-01 2.8654E-01 2.7188E-01

N = 2  X = WMM/WCR =  3.88000E-01  WT FLOW CALC =  2.41704E-02   D =  2.42307E-01


WSH =  6.88341E-01  WMH =  5.20824E-01  WPH =  4.19368E-01
WSM =  6.56248E-01  WMM =  4.88000E-01  WPM =  3.87678E-01
WST =  6.24287E-01  WMT =  4.56055E-01  WPT =  3.57331E-01

  A(IK)
```

5.6974E-01 5.4258E-01 5.1646E-01 4.9180E-01 4.6876E-01 4.4734E-01 4.2748E-01 4.0907E-01 3.9202E-01
5.5318E-01 5.2351E-01 4.9544E-01 4.6928E-01 4.4508E-01 4.2279E-01 4.0228E-01 3.8341E-01 3.6604E-01
5.3532E-01 5.0335E-01 4.7354E-01 4.4609E-01 4.2096E-01 3.9800E-01 3.7704E-01 3.5789E-01 3.4036E-01

N = 3 X = WMM/WCR = 4.88000E-01 WT FLOW CALC = 2.92453E-02 D = 8.32182E-02

WSH = 7.68154E-01 WMH = 5.81213E-01 WPH = 4.67994E-01
WSM = 7.36256E-01 WMM = 5.47496E-01 WPM = 4.34942E-01
WST = 7.04592E-01 WMT = 5.14720E-01 WPT = 4.03297E-01

A(IK)

6.0463E-01 5.8051E-01 5.5603E-01 5.3210E-01 5.0917E-01 4.8747E-01 4.6707E-01 4.4796E-01 4.3009E-01
5.9180E-01 5.6459E-01 5.3760E-01 5.1165E-01 4.8713E-01 4.6416E-01 4.4277E-01 4.2290E-01 4.0446E-01
5.7759E-01 5.4743E-01 5.1812E-01 4.9036E-01 4.6444E-01 4.4042E-01 4.1825E-01 3.9780E-01 3.7895E-01

N = 4 X = WMM/WCR = 5.47496E-01 WT FLOW CALC = 3.19086E-02 D = -2.68534E-04

THIRD STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.72000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.72730E 02	0.00000E-39	2.00200E-01
MEAN	7.13000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.72730E 02		
TIP	7.56000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.72730E 02	0.00000E-39	2.24800E-01

	BETA		
HUB	4.50000E 01	4.50000E 01	4.50000E 01
MEAN	4.50000E 01	4.50000E 01	4.50000E 01
TIP	4.50000E 01	4.50000E 01	4.50000E 01

ID1 = 0 ID2 = 8 X = 5.81000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.32893E 00 VSM = 1.35219E 00 VST = 1.37702E 00 VPH = 8.01768E-01

VPM = 7.91033E-01 VPT = 7.79929E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-2.49750E 00	1.77767E 03	-3.83991E-03
2	-2.45972E 00	1.77767E 03	-3.78182E-03
3	-2.42307E 00	1.77767E 03	-3.72547E-03
4	-2.38749E 00	1.77767E 03	-3.67076E-03
5	-2.35294E 00	1.77767E 03	-3.61765E-03
6	-2.31938E 00	1.77767E 03	-3.56604E-03
7	-2.28676E 00	1.77767E 03	-3.51589E-03
8	-2.25505E 00	1.77767E 03	-3.46713E-03
9	-2.22420E 00	1.77767E 03	-3.41971E-03

IK	M(IK)	N(IK)
1	2.98137E-02	1.72545E 03
2	2.21919E-02	1.73865E 03

```
3      1.46846E-02          1.75175E 03
4      7.28841E-03          1.76476E 03
5      0.00000E-39          1.77767E 03
6     -7.18369E-03          1.79048E 03
7     -1.42656E-02          1.80321E 03
8     -2.12486E-02          1.81584E 03
9     -2.81355E-02          1.82839E 03

 PH = -2.15458E 01   PM =  0.00000E-39   PT =  2.21787E 01

QH =  1.03026E 00   QM =  1.00000E 00   QT =  9.72257E-01


WSH =  8.43752E-01  WMH =  6.34911E-01  WPH =  5.09051E-01
WSM =  7.85622E-01  WMM =  5.81000E-01  WPM =  4.59590E-01
WST =  7.29257E-01  WMT =  5.29591E-01  WPT =  4.13043E-01

  A(IK)

6.2885E-01 6.0887E-01 5.8671E-01 5.6393E-01 5.4140E-01 5.1960E-01 4.9877E-01 4.7902E-01 4.6040E-01
6.1101E-01 5.8576E-01 5.5961E-01 5.3382E-01 5.0904E-01 4.8556E-01 4.6350E-01 4.4289E-01 4.2368E-01
5.8878E-01 5.5899E-01 5.2953E-01 5.0136E-01 4.7488E-01 4.5024E-01 4.2743E-01 4.0635E-01 3.8690E-01

N = 1  X = WMM/WCR =  5.81000E-01  WT FLOW CALC =  3.34390E-02   D = -4.82431E-02


WSH =  7.75295E-01  WMH =  5.83398E-01  WPH =  4.67750E-01
WSM =  7.18012E-01  WMM =  5.31000E-01  WPM =  4.20039E-01
WST =  6.62316E-01  WMT =  4.80978E-01  WPT =  3.75129E-01

  A(IK)

6.0729E-01 5.8304E-01 5.5824E-01 5.3390E-01 5.1055E-01 4.8842E-01 4.6761E-01 4.4812E-01 4.2991E-01
5.8379E-01 5.5532E-01 5.2742E-01 5.0083E-01 4.7586E-01 4.5260E-01 4.3102E-01 4.1104E-01 3.9256E-01
5.5642E-01 5.2447E-01 4.9415E-01 4.6592E-01 4.3987E-01 4.1595E-01 3.9402E-01 3.7393E-01 3.5551E-01

N = 2  X = WMM/WCR =  5.31000E-01  WT FLOW CALC =  3.13540E-02   D =  1.71154E-02


WSH =  8.09524E-01  WMH =  6.09154E-01  WPH =  4.88401E-01
WSM =  7.51817E-01  WMM =  5.56000E-01  WPM =  4.39814E-01
WST =  6.95786E-01  WMT =  5.05284E-01  WPT =  3.94086E-01

  A(IK)
```

6.1899E-01 5.9669E-01 5.7308E-01 5.4942E-01 5.2640E-01 5.0436E-01 4.8349E-01 4.6383E-01 4.4538E-01
5.9824E-01 5.7121E-01 5.4406E-01 5.1777E-01 4.9281E-01 4.6938E-01 4.4752E-01 4.2719E-01 4.0830E-01
5.7338E-01 5.4234E-01 5.1233E-01 4.8403E-01 4.5769E-01 4.3336E-01 4.1094E-01 3.9033E-01 3.7136E-01

N = 3 X = WMM/WCR = 5.56000E-01 WT FLOW CALC = 3.24236E-02 D = -1.64136E-02

WSH = 7.92551E-01 WMH = 5.96383E-01 WPH = 4.78161E-01
WSM = 7.35054E-01 WMM = 5.43603E-01 WPM = 4.30008E-01
WST = 6.79189E-01 WMT = 4.93232E-01 WPT = 3.84685E-01

A(IK)

6.1341E-01 5.9010E-01 5.6587E-01 5.4185E-01 5.1864E-01 4.9655E-01 4.7569E-01 4.5610E-01 4.3776E-01
5.9128E-01 5.6349E-01 5.3594E-01 5.0948E-01 4.8450E-01 4.6113E-01 4.3940E-01 4.1923E-01 4.0054E-01
5.6516E-01 5.3363E-01 5.0344E-01 4.7514E-01 4.4893E-01 4.2479E-01 4.0260E-01 3.8224E-01 3.6354E-01

N = 4 X = WMM/WCR = 5.43603E-01 WT FLOW CALC = 3.18999E-02 D = 3.87430E-06

THIRD STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.79000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.70900E 02	0.00000E-39	2.00200E-01
MEAN	7.21000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.70900E 02		
TIP	7.64000E-03	9.79600E 01	5.89700E 01	6.11030E 02	3.70900E 02	0.00000E-39	2.24800E-01

	BETA		
HUB	5.50000E 01	5.50000E 01	5.50000E 01
MEAN	5.50000E 01	5.50000E 01	5.50000E 01
TIP	5.50000E 01	5.50000E 01	5.50000E 01

ID1 = 0 ID2 = 9 X = 5.79000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.33287E 00 VSM = 1.35677E 00 VST = 1.38169E 00 VPH = 7.99925E-01

VPM = 7.88955E-01 VPT = 7.77880E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.35170E 00	2.05935E 03	-5.15324E-03
2	-3.30100E 00	2.05935E 03	-5.07528E-03
3	-3.25180E 00	2.05935E 03	-4.99965E-03
4	-3.20406E 00	2.05935E 03	-4.92624E-03
5	-3.15769E 00	2.05935E 03	-4.85495E-03
6	-3.11265E 00	2.05935E 03	-4.78570E-03
7	-3.06888E 00	2.05935E 03	-4.71840E-03
8	-3.02632E 00	2.05935E 03	-4.65296E-03
9	-2.98492E 00	2.05935E 03	-4.58931E-03

IK	M(IK)	N(IK)
1	4.00105E-02	1.97858E 03
2	2.97820E-02	1.99892E 03

```
3      1.97071E-02          2.01916E 03
4      9.78119E-03          2.03930E 03
5      0.00000E-39          2.05935E 03
6     -9.64066E-03          2.07930E 03
7     -1.91448E-02          2.09915E 03
8     -2.85161E-02          2.11892E 03
9     -3.77584E-02          2.13859E 03

 PH = -2.48349E 01   PM =  0.000000E-39   PT =  2.58188E 01

QH =  1.04082E 00   QM =  1.00000E 00   QT =  9.62946E-01


WSH =  8.59622E-01  WMH =  6.44939E-01  WPH =  5.15903E-01
WSM =  7.85572E-01  WMM =  5.79000E-01  WPM =  4.56805E-01
WST =  7.14135E-01  WMT =  5.16857E-01  WPT =  4.02052E-01

  A(IK)

6.3280E-01 6.1378E-01 5.9212E-01 5.6953E-01 5.4701E-01 5.2510E-01 5.0410E-01 4.8414E-01 4.6528E-01
6.1099E-01 5.8544E-01 5.5896E-01 5.3285E-01 5.0777E-01 4.8402E-01 4.6174E-01 4.4092E-01 4.2153E-01
5.8202E-01 5.5129E-01 5.2122E-01 4.9266E-01 4.6596E-01 4.4121E-01 4.1836E-01 3.9731E-01 3.7793E-01

N = 1  X = WMM/WCR =  5.79000E-01  WT FLOW CALC =  3.35421E-02   D = -5.14751E-02


WSH =  5.82165E-01  WMH =  4.36775E-01  WPH =  3.49387E-01
WSM =  5.14217E-01  WMM =  3.79000E-01  WPM =  2.99014E-01
WST =  4.48037E-01  WMT =  3.24267E-01  WPT =  2.52241E-01

  A(IK)

5.0977E-01 4.8032E-01 4.5324E-01 4.2848E-01 4.0591E-01 3.8531E-01 3.6650E-01 3.4930E-01 3.3352E-01
4.6409E-01 4.3343E-01 4.0584E-01 3.8106E-01 3.5877E-01 3.3868E-01 3.2051E-01 3.0404E-01 2.8905E-01
4.1474E-01 3.8404E-01 3.5692E-01 3.3291E-01 3.1157E-01 2.9253E-01 2.7547E-01 2.6012E-01 2.4625E-01

N = 2  X = WMM/WCR =  3.79000E-01  WT FLOW CALC =  2.39435E-02   D =  2.49420E-01


WSH =  7.20894E-01  WMH =  5.40857E-01  WPH =  4.32645E-01
WSM =  6.49895E-01  WMM =  4.79000E-01  WPM =  3.77910E-01
WST =  5.81086E-01  WMT =  4.20562E-01  WPT =  3.27147E-01

  A(IK)
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5.8508E-01 5.5812E-01 5.3169E-01 5.0643E-01 4.8263E-01 4.6039E-01 4.3970E-01 4.2048E-01 4.0264E-01
5.4974E-01 5.1905E-01 4.9099E-01 4.6319E-01 4.3839E-01 4.1560E-01 3.9468E-01 3.7549E-01 3.5785E-01
5.0909E-01 4.7595E-01 4.4559E-01 4.1799E-01 3.9298E-01 3.7032E-01 3.4977E-01 3.3111E-01 3.1411E-01

N = 3  X = WMM/WCR =  4.79000E-01  WT FLOW CALC =  2.91284E-02   D =  8.68827E-02


WSH =  8.05117E-01  WMH =  6.04047E-01  WPH =  4.83192E-01
WSM =  7.32266E-01  WMM =  5.39711E-01  WPM =  4.25808E-01
WST =  6.61862E-01  WMT =  4.79024E-01  WPT =  3.72623E-01

  A(IK)

6.1758E-01 5.9476E-01 5.7070E-01 5.4666E-01 5.2332E-01 5.0103E-01 4.7994E-01 4.6011E-01 4.4152E-01
5.9009E-01 5.6185E-01 5.3391E-01 5.0711E-01 4.8185E-01 4.5825E-01 4.3633E-01 4.1601E-01 3.9719E-01
5.5618E-01 5.2387E-01 4.9323E-01 4.6470E-01 4.3841E-01 4.1427E-01 3.9217E-01 3.7194E-01 3.5339E-01

N = 4  X = WMM/WCR =  5.39711E-01  WT FLOW CALC =  3.19087E-02   D = -2.74241E-04
```

FOURTH STAGE WHEEL 101 BLADES VARIABLE PASSAGE, VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	5.58000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.95480E 02	0.00000E-39	1.87400E-01
MEAN	6.33000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.95480E 02		
TIP	7.09000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.95480E 02	0.00000E-39	2.37600E-01

	BETA		
HUB	4.30000E 01	4.30000E 01	4.30000E 01
MEAN	4.30000E 01	4.30000E 01	4.30000E 01
TIP	4.30000E 01	4.30000E 01	4.30000E 01

ID1 = 0 ID2 = 0 X = 6.90000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 1 KR5 = 1 KR6 = 2 KR7 = 1

VSH = 1.26634E 00 VSM = 1.30718E 00 VST = 1.34990E 00 VPH = 8.32389E-01

VPM = 8.12115E-01 VPT = 7.92074E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-2.48197E 00	1.71454E 03	-7.78719E-03
2	-2.40156E 00	1.71454E 03	-7.53489E-03
3	-2.32619E 00	1.71454E 03	-7.29842E-03
4	-2.25541E 00	1.71454E 03	-7.07634E-03
5	-2.18881E 00	1.71454E 03	-6.86738E-03
6	-2.12603E 00	1.71454E 03	-6.67041E-03
7	-2.06675E 00	1.71454E 03	-6.48442E-03
8	-2.01068E 00	1.71454E 03	-6.30852E-03
9	-1.95758E 00	1.71454E 03	-6.14192E-03

IK	M(IK)	N(IK)
1	5.84739E-02	1.61716E 03
2	4.31518E-02	1.64213E 03

```
3      2.83185E-02          1.66667E 03
4      1.39437E-02          1.69080E 03
5      0.00000E-39          1.71454E 03
6     -1.35378E-02          1.73791E 03
7     -2.66926E-02          1.76093E 03
8     -3.94856E-02          1.78360E 03
9     -5.19360E-02          1.80594E 03

 PH = -4.18266E 01   PM =  0.00000E-39   PT =  4.41935E 01

QH =  1.06022E 00   QM =  1.00000E 00   QT =  9.49390E-01


WSH =  1.02349E 00  WMH =  8.08228E-01  WPH =  6.72760E-01
WSM =  9.01953E-01  WMM =  6.90000E-01  WPM =  5.60359E-01
WST =  7.86359E-01  WMT =  5.82530E-01  WPT =  4.61407E-01

  A(IK)

6.4906E-01 6.4805E-01 6.4131E-01 6.3101E-01 6.1858E-01 6.0493E-01 5.9068E-01 5.7624E-01 5.6188E-01
6.4132E-01 6.2711E-01 6.0951E-01 5.9030E-01 5.7056E-01 5.5093E-01 5.3179E-01 5.1334E-01 4.9570E-01
6.1127E-01 5.8621E-01 5.6026E-01 5.3464E-01 5.1000E-01 4.8666E-01 4.6472E-01 4.4420E-01 4.2507E-01

N = 1  X = WMM/WCR =  6.90000E-01  WT FLOW CALC =  3.51733E-02   D = -1.02610E-01


WSH =  7.54974E-01  WMH =  5.96185E-01  WPH =  4.96257E-01
WSM =  6.40517E-01  WMM =  4.90000E-01  WPM =  3.97936E-01
WST =  5.30042E-01  WMT =  3.92653E-01  WPT =  3.11010E-01

  A(IK)

5.9951E-01 5.7872E-01 5.5799E-01 5.3783E-01 5.1852E-01 5.0018E-01 4.8285E-01 4.6651E-01 4.5114E-01
5.4456E-01 5.1751E-01 4.9209E-01 4.6844E-01 4.4656E-01 4.2635E-01 4.0769E-01 3.9047E-01 3.7454E-01
4.7520E-01 4.4480E-01 4.1732E-01 3.9254E-01 3.7017E-01 3.4996E-01 3.3163E-01 3.1498E-01 2.9980E-01

N = 2  X = WMM/WCR =  4.90000E-01  WT FLOW CALC =  2.77959E-02   D =  1.28657E-01


WSH =  8.89233E-01  WMH =  7.02206E-01  WPH =  5.84509E-01
WSM =  7.71235E-01  WMM =  5.90000E-01  WPM =  4.79148E-01
WST =  6.58201E-01  WMT =  4.87592E-01  WPT =  3.86209E-01

  A(IK)
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6.3907E-01 6.2568E-01 6.1029E-01 5.9356E-01 5.7646E-01 5.5945E-01 5.4282E-01 5.2672E-01 5.1125E-01
6.0579E-01 5.8282E-01 5.5949E-01 5.3664E-01 5.1469E-01 4.9386E-01 4.7422E-01 4.5578E-01 4.3850E-01
5.5423E-01 5.2421E-01 4.9578E-01 4.6928E-01 4.4478E-01 4.2221E-01 4.0146E-01 3.8237E-01 3.6481E-01

N = 3 X = WMM/WCR = 5.900[illegible]E-01 WT FLOW CALC = 3.19054E-02 D = -1.70022E-04

FOURTH STAGE WHEEL 101 BLADES VARIABLE PASSAGE, VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	5.66000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.92580E 02	0.00000E-39	1.87400E-01
MEAN	6.42000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.92580E 02		
TIP	7.19000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.92580E 02	0.00000E-39	2.37600E-01

	BETA		
HUB	3.00000E 01	3.00000E 01	3.00000E 01
MEAN	3.00000E 01	3.00000E 01	3.00000E 01
TIP	3.00000E 01	3.00000E 01	3.00000E 01

ID1 = 0 ID2 = 1 X = 6.78000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.27064E 00 VSM = 1.31217E 00 VST = 1.35563E 00 VPH = 8.30202E-01

VPM = 8.09715E-01 VPT = 7.89474E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-1.33404E 00	1.25700E 03	-4.18556E-03
2	-1.29082E 00	1.25700E 03	-4.04995E-03
3	-1.25031E 00	1.25700E 03	-3.92285E-03
4	-1.21227E 00	1.25700E 03	-3.80349E-03
5	-1.17647E 00	1.25700E 03	-3.69118E-03
6	-1.14273E 00	1.25700E 03	-3.58530E-03
7	-1.11086E 00	1.25700E 03	-3.48534E-03
8	-1.08073E 00	1.25700E 03	-3.39079E-03
9	-1.05219E 00	1.25700E 03	-3.30124E-03

IK	M(IK)	N(IK)
1	3.14293E-02	1.21811E 03
2	2.31938E-02	1.22818E 03

3	1.52210E-02	1.23801E 03
4	7.49467E-03	1.24761E 03
5	0.00000E-39	1.25700E 03
6	-7.27648E-03	1.26618E 03
7	-1.43471E-02	1.27516E 03
8	-2.12232E-02	1.28396E 03
9	-2.79153E-02	1.29258E 03

PH = -3.10703E 01 PM = 0.00000E-39 PT = 3.20035E 01

QH = 1.03193E 00 QM = 1.00000E 00 QT = 9.72471E-01

WSH = 9.59441E-01 WMH = 7.55087E-01 WPH = 6.26875E-01
WSM = 8.89648E-01 WMM = 6.78000E-01 WPM = 5.48987E-01
WST = 8.20860E-01 WMT = 6.05521E-01 WPT = 4.78043E-01

A(IK)

6.4812E-01 6.4058E-01 6.2890E-01 6.1485E-01 5.9955E-01 5.8373E-01 5.6782E-01 5.5212E-01 5.3681E-01
6.3914E-01 6.2365E-01 6.0501E-01 5.8497E-01 5.6456E-01 5.4440E-01 5.2482E-01 5.0604E-01 4.8813E-01
6.2246E-01 5.9923E-01 5.7417E-01 5.4888E-01 5.2421E-01 5.0061E-01 4.7828E-01 4.5731E-01 4.3767E-01

N = 1 X = WMM/WCR = 6.78000E-01 WT FLOW CALC = 3.49125E-02 D = -9.44373E-02

WSH = 6.97200E-01 WMH = 5.48701E-01 WPH = 4.55533E-01
WSM = 6.27215E-01 WMM = 4.78000E-01 WPM = 3.87044E-01
WST = 5.57199E-01 WMT = 4.11027E-01 WPT = 3.24495E-01

A(IK)

5.7407E-01 5.5104E-01 5.2884E-01 5.0777E-01 4.8794E-01 4.6935E-01 4.5197E-01 4.3573E-01 4.2055E-01
5.3701E-01 5.0941E-01 4.8360E-01 4.5969E-01 4.3764E-01 4.1733E-01 3.9864E-01 3.8141E-01 3.6551E-01
4.9361E-01 4.6251E-01 4.3419E-01 4.0852E-01 3.8527E-01 3.6420E-01 3.4506E-01 3.2765E-01 3.1177E-01

N = 2 X = WMM/WCR = 4.78000E-01 WT FLOW CALC = 2.73167E-02 D = 1.43677E-01

WSH = 8.28320E-01 WMH = 6.51894E-01 WPH = 5.41204E-01
WSM = 7.58432E-01 WMM = 5.78000E-01 WPM = 4.68015E-01
WST = 6.89029E-01 WMT = 5.08274E-01 WPT = 4.01269E-01

A(IK)

```
6.2463E-01 6.0717E-01 5.8849E-01 5.6953E-01 5.5083E-01 5.3268E-01 5.1527E-01 4.9865E-01 4.8287E-01
6.0088E-01 5.7696E-01 5.5290E-01 5.2949E-01 5.0713E-01 4.8598E-01 4.6612E-01 4.4751E-01 4.3011E-01
5.7008E-01 5.4040E-01 5.1182E-01 4.8491E-01 4.5984E-01 4.3664E-01 4.1523E-01 3.9549E-01 3.7729E-01

N = 3  X = WMM/WCR =  5.78000E-01  WT FLOW CALC =  3.15290E-02   D =  1.16290E-02


WSH =  8.41267E-01  WMH =  6.62083E-01  WPH =  5.49663E-01
WSM =  7.71388E-01  WMM =  5.87874E-01  WPM =  4.76011E-01
WST =  7.02046E-01  WMT =  5.17876E-01  WPT =  4.08850E-01

  A(IK)

6.2820E-01 6.1152E-01 5.9337E-01 5.7477E-01 5.5630E-01 5.3830E-01 5.2096E-01 5.0437E-01 4.8858E-01
6.0584E-01 5.8254E-01 5.5885E-01 5.3564E-01 5.1336E-01 4.9223E-01 4.7232E-01 4.5364E-01 4.3615E-01
5.7638E-01 5.4710E-01 5.1870E-01 4.9181E-01 4.6668E-01 4.4336E-01 4.2179E-01 4.0188E-01 3.8349E-01

N = 4  X = WMM/WCR =  5.87874E-01  WT FLOW CALC =  3.19019E-02   D = -5.87404E-05
```

FOURTH STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	5.77000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.89690E 02	0.00000E-39	1.87400E-01
MEAN	6.54000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.89690E 02		
TIP	7.32000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.89690E 02	0.00000E-39	2.37600E-01

	BETA		
HUB	1.50000E 01	1.50000E 01	1.50000E 01
MEAN	1.50000E 01	1.50000E 01	1.50000E 01
TIP	1.50000E 01	1.50000E 01	1.50000E 01

ID1 = 0 ID2 = 2 X = 6.62000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.27656E 00 VSM = 1.31885E 00 VST = 1.36310E 00 VPH = 8.27205E-01

VPM = 8.06527E-01 VPT = 7.86107E-01

K	LITTLE A	LITTLE B	ALPHA
1	-3.57456E-01	6.50671E 02	-1.12152E-03
2	-3.45875E-01	6.50671E 02	-1.08518E-03
3	-3.35020E-01	6.50671E 02	-1.05113E-03
4	-3.24826E-01	6.50671E 02	-1.01914E-03
5	-3.15234E-01	6.50671E 02	-9.89047E-04
6	-3.06193E-01	6.50671E 02	-9.60679E-04
7	-2.97655E-01	6.50671E 02	-9.33893E-04
8	-2.89581E-01	6.50671E 02	-9.08560E-04
9	-2.81933E-01	6.50671E 02	-8.84565E-04

K	M(IK)	N(IK)
1	8.42147E-03	6.45214E 02
2	6.21476E-03	6.46640E 02

```
3      4.07846E-03          6.48023E 02
4      2.00819E-03          6.49366E 02
5      0.00000E-39          6.50671E 02
6     -1.94973E-03          6.51941E 02
7     -3.84430E-03          6.53177E 02
8     -5.68675E-03          6.54382E 02
9     -7.47988E-03          6.55556E 02

 PH = -1.62647E 01   PM =  0.000000E-39   PT =  1.63942E 01

QH =  1.00846E 00   QM =  1.00000E 00   QT =  9.92548E-01


WSH =  8.88438E-01  WMH =  6.95960E-01  WPH =  5.75702E-01
WSM =  8.73076E-01  WMM =  6.62000E-01  WPM =  5.33921E-01
WST =  8.57298E-01  WMT =  6.28931E-01  WPT =  4.94407E-01

  A(IK)

6.3892E-01 6.2515E-01 6.0884E-01 5.9134E-01 5.7347E-01 5.5573E-01 5.3842E-01 5.2170E-01 5.0566E-01
6.3582E-01 6.1864E-01 5.9864E-01 5.7752E-01 5.5625E-01 5.3541E-01 5.1531E-01 4.9611E-01 4.7788E-01
6.3225E-01 6.1134E-01 5.8746E-01 5.6263E-01 5.3799E-01 5.1416E-01 4.9143E-01 4.6997E-01 4.4979E-01

N = 1  X = WMM/WCR =  6.62000E-01  WT FLOW CALC =  3.46369E-02   D = -8.57964E-02


WSH =  6.30966E-01  WMH =  4.94269E-01  WPH =  4.08862E-01
WSM =  6.09307E-01  WMM =  4.62000E-01  WPM =  3.72615E-01
WST =  5.86709E-01  WMT =  4.30421E-01  WPT =  3.38357E-01

  A(IK)

5.3916E-01 5.1441E-01 4.9123E-01 4.6967E-01 4.4969E-01 4.3120E-01 4.1408E-01 3.9822E-01 3.8350E-01
5.2649E-01 4.9820E-01 4.7194E-01 4.4775E-01 4.2552E-01 4.0513E-01 3.8642E-01 3.6922E-01 3.5339E-01
5.1263E-01 4.8088E-01 4.5170E-01 4.2508E-01 4.0087E-01 3.7887E-01 3.5885E-01 3.4060E-01 3.2394E-01

N = 2  X = WMM/WCR =  4.62000E-01  WT FLOW CALC =  2.67561E-02   D =  1.61252E-01


WSH =  7.59702E-01  WMH =  5.95114E-01  WPH =  4.92282E-01
WSM =  7.41191E-01  WMM =  5.62000E-01  WPM =  4.53268E-01
WST =  7.22003E-01  WMT =  5.29676E-01  WPT =  4.16382E-01

  A(IK)
```

6.0137E-01 5.8004E-01 5.5866E-01 5.3783E-01 5.1786E-01 4.9889E-01 4.8097E-01 4.6410E-01 4.4823E-01
5.9388E-01 5.6873E-01 5.4375E-01 5.1965E-01 4.9677E-01 4.7526E-01 4.5512E-01 4.3632E-01 4.1880E-01
5.8558E-01 5.5648E-01 5.2787E-01 5.0058E-01 4.7494E-01 4.5108E-01 4.2896E-01 4.0851E-01 3.8961E-01

N = 3 X = WMM/WCR = 5.62000E-01 WT FLOW CALC = 3.11051E-02 D = 2.49199E-02

WSH = 7.86240E-01 WMH = 6.15903E-01 WPH = 5.09479E-01
WSM = 7.68379E-01 WMM = 5.82615E-01 WPM = 4.69895E-01
WST = 7.49894E-01 WMT = 5.50137E-01 WPT = 4.32467E-01

A(IK)

6.1123E-01 5.9110E-01 5.7049E-01 5.5013E-01 5.3041E-01 5.1155E-01 4.9363E-01 4.7669E-01 4.6071E-01
6.0471E-01 5.8080E-01 5.5653E-01 5.3280E-01 5.1006E-01 4.8852E-01 4.6827E-01 4.4928E-01 4.3153E-01
5.9747E-01 5.6958E-01 5.4160E-01 5.1454E-01 4.8890E-01 4.6488E-01 4.4251E-01 4.2174E-01 4.0250E-01

N = 4 X = WMM/WCR = 5.82615E-01 WT FLOW CALC = 3.19039E-02 D = -1.21608E-04

FOURTH STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	5.88000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.86220E 02	0.00000E-39	1.87400E-01
MEAN	6.67000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.86220E 02		
TIP	7.47000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.86220E 02	0.00000E-39	2.37600E-01

	BETA		
HUB	5.00000E 00	5.00000E 00	5.00000E 00
MEAN	5.00000E 00	5.00000E 00	5.00000E 00
TIP	5.00000E 00	5.00000E 00	5.00000E 00

ID1 = 0 ID2 = 3 X = 6.52000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.28252E 00 VSM = 1.32612E 00 VST = 1.37178E 00 VPH = 8.24219E-01

VPM = 8.03087E-01 VPT = 7.82240E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-4.05343E-02	2.19110E 02	-1.27176E-04
2	-3.92210E-02	2.19110E 02	-1.23056E-04
3	-3.79901E-02	2.19110E 02	-1.19194E-04
4	-3.68341E-02	2.19110E 02	-1.15567E-04
5	-3.57465E-02	2.19110E 02	-1.12154E-04
6	-3.47212E-02	2.19110E 02	-1.08938E-04
7	-3.37530E-02	2.19110E 02	-1.05900E-04
8	-3.28374E-02	2.19110E 02	-1.03027E-04
9	-3.19702E-02	2.19110E 02	-1.00307E-04

IK	M(IK)	N(IK)
1	9.54964E-04	2.18900E 02
2	7.04732E-04	2.18955E 02

```
3      4.62483E-04          2.19008E 02
4      2.27722E-04          2.19060E 02
5      0.00000E-39          2.19110E 02
6     -2.21092E-04          2.19158E 02
7     -4.35930E-04          2.19205E 02
8     -6.44858E-04          2.19251E 02
9     -8.48192E-04          2.19295E 02

 PH = -5.49708E 00   PM =  0.00000E-39   PT =  5.50202E 00

QH =  1.00096E 00   QM =  1.00000E 00   QT =  9.99152E-01


WSH =  8.49205E-01  WMH =  6.62137E-01  WPH =  5.45746E-01
WSM =  8.64631E-01  WMM =  6.52000E-01  WPM =  5.23613E-01
WST =  8.80606E-01  WMT =  6.41942E-01  WPT =  5.02152E-01

  A(IK)

6.3025E-01 6.1338E-01 5.9474E-01 5.7550E-01 5.5633E-01 5.3762E-01 5.1959E-01 5.0235E-01 4.8595E-01
6.3396E-01 6.1571E-01 5.9477E-01 5.7284E-01 5.5088E-01 5.2947E-01 5.0888E-01 4.8928E-01 4.7072E-01
6.3739E-01 6.1803E-01 5.9482E-01 5.7015E-01 5.4535E-01 5.2118E-01 4.9803E-01 4.7659E-01 4.5543E-01

N = 1  X = WMM/WCR =  6.52000E-01  WT FLOW CALC =  3.43985E-02   D = -7.83239E-02


WSH =  5.92455E-01  WMH =  4.61946E-01  WPH =  3.80745E-01
WSM =  5.99407E-01  WMM =  4.52000E-01  WPM =  3.62995E-01
WST =  6.06481E-01  WMT =  4.42111E-01  WPT =  3.45837E-01

  A(IK)

5.1622E-01 4.9072E-01 4.6715E-01 4.4544E-01 4.2548E-01 4.0713E-01 3.9023E-01 3.7464E-01 3.6024E-01
5.2050E-01 4.9160E-01 4.6486E-01 4.4031E-01 4.1782E-01 3.9724E-01 3.7839E-01 3.6110E-01 3.4521E-01
5.2479E-01 4.9245E-01 4.6252E-01 4.3511E-01 4.1011E-01 3.8735E-01 3.6662E-01 3.4771E-01 3.3044E-01

N = 2  X = WMM/WCR =  4.52000E-01  WT FLOW CALC =  2.63664E-02   D =  1.73468E-01


WSH =  7.20830E-01  WMH =  5.62042E-01  WPH =  4.63245E-01
WSM =  7.32019E-01  WMM =  5.52000E-01  WPM =  4.43304E-01
WST =  7.43543E-01  WMT =  5.42026E-01  WPT =  4.23995E-01

  A(IK)
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```
5.8505E-01 5.6182E-01 5.3912E-01 5.1738E-01 4.9680E-01 4.7745E-01 4.5931E-01 4.4234E-01 4.2647E-01
5.8998E-01 5.6393E-01 5.3822E-01 5.1351E-01 4.9015E-01 4.6824E-01 4.4779E-01 4.2875E-01 4.1104E-01
5.9486E-01 5.6607E-01 5.3731E-01 5.0960E-01 4.8343E-01 4.5897E-01 4.3625E-01 4.1520E-01 3.9574E-01

N = 3  X = WMM/WCR =  5.52000E-01  WT FLOW CALC =  3.07877E-02   D =  3.48668E-02


WSH =  7.57437E-01  WMH =  5.90584E-01  WPH =  4.86771E-01
WSM =  7.69834E-01  WMM =  5.80515E-01  WPM =  4.66205E-01
WST =  7.82627E-01  WMT =  5.70518E-01  WPT =  4.46282E-01

  A(IK)

6.0048E-01 5.7863E-01 5.5675E-01 5.3545E-01 5.1505E-01 4.9571E-01 4.7746E-01 4.6029E-01 4.4417E-01
6.0526E-01 5.8092E-01 5.5616E-01 5.3194E-01 5.0873E-01 4.8676E-01 4.6612E-01 4.4679E-01 4.2873E-01
6.0995E-01 5.8323E-01 5.5558E-01 5.2838E-01 5.0232E-01 4.7773E-01 4.5472E-01 4.3329E-01 4.1337E-01

N = 4  X = WMM/WCR =  5.80515E-01  WT FLOW CALC =  3.19052E-02   D = -1.63481E-04
```

FOURTH STAGE WHEEL 101 BLADES VARIABLE PASSAGE, VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT 8/5/66

NLIM = 5 TLIM = 0.001

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	5.92000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.85640E 02	0.00000E-39	1.87400E-01
MEAN	6.71000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.85640E 02		
TIP	7.52000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.85640E 02	0.00000E-39	2.37600E-01

	BETA		
HUB	0.00000E-39	0.00000E-39	0.00000E-39
MEAN	0.00000E-39	0.00000E-39	0.00000E-39
TIP	0.00000E-39	0.00000E-39	0.00000E-39

ID1 = 0 ID2 = 4 X = 6.46000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.28469E 00 VSM = 1.32837E 00 VST = 1.37469E 00 VPH = 8.23136E-01

VPM = 8.02032E-01 VPT = 7.80955E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-0.00000E-39	0.00000E-39	-0.00000E-39
2	-0.00000E-39	0.00000E-39	-0.00000E-39
3	-0.00000E-39	0.00000E-39	-0.00000E-39
4	-0.00000E-39	0.00000E-39	-0.00000E-39
5	-0.00000E-39	0.00000E-39	-0.00000E-39
6	-0.00000E-39	0.00000E-39	-0.00000E-39
7	-0.00000E-39	0.00000E-39	-0.00000E-39
8	-0.00000E-39	0.00000E-39	-0.00000E-39
9	-0.00000E-39	0.00000E-39	-0.00000E-39

IK	M(IK)	N(IK)
1	0.00000E-39	0.00000E-39
2	0.00000E-39	0.00000E-39

```
3     0.00000E-39          0.00000E-39
4     0.00000E-39          0.00000E-39
5     0.00000E-39          0.00000E-39
6    -0.00000E-39          0.00000E-39
7    -0.00000E-39          0.00000E-39
8    -0.00000E-39          0.00000E-39
9    -0.00000E-39          0.00000E-39

 PH = -0.00000E-39   PM =  0.00000E-39   PT =  0.00000E-39

QH =  1.00000E 00   QM =  1.00000E 00   QT =  1.00000E 00


WSH =  8.29912E-01  WMH =  6.46000E-01  WPH =  5.31746E-01
WSM =  8.58126E-01  WMM =  6.46000E-01  WPM =  5.18113E-01
WST =  8.88050E-01  WMT =  6.46000E-01  WPT =  5.04497E-01

  A(IK)

6.2509E-01 6.0684E-01 5.8722E-01 5.6727E-01 5.476[illegible]E-01 5.2854E-01 5.1027E-01 4.9287E-01 4.7638E-01
6.3244E-01 6.1356E-01 5.9214E-01 5.6983E-01 5.476[illegible]E-01 5.2596E-01 5.0522E-01 4.8549E-01 4.6685E-01
6.3884E-01 6.2003E-01 5.9706E-01 5.7244E-01 5.476[illegible]E-01 5.2332E-01 5.0003E-01 4.7794E-01 4.5713E-01

N = 1  X = WMM/WCR =  6.46000E-01  WT FLOW CALC =  3.43246E-02   D = -7.60056E-02


WSH =  5.72973E-01  WMH =  4.46000E-01  WPH =  3.67119E-01
WSM =  5.92452E-01  WMM =  4.46000E-01  WPM =  3.57706E-01
WST =  6.13112E-01  WMT =  4.46000E-01  WPT =  3.48306E-01

  A(IK)

5.0391E-01 4.7823E-01 4.5462E-01 4.3298E-01 4.1315E-01 3.9497E-01 3.7827E-01 3.6290E-01 3.4872E-01
5.1621E-01 4.8712E-01 4.6027E-01 4.3566E-01 4.1315E-01 3.9258E-01 3.7376E-01 3.5652E-01 3.4068E-01
5.2876E-01 4.9625E-01 4.6608E-01 4.3841E-01 4.1315E-01 3.9014E-01 3.6918E-01 3.5005E-01 3.3258E-01

N = 2  X = WMM/WCR =  4.46000E-01  WT FLOW CALC =  2.61809E-02   D =  1.79282E-01


WSH =  7.01443E-01  WMH =  5.46000E-01  WPH =  4.49432E-01
WSM =  7.25289E-01  WMM =  5.46000E-01  WPM =  4.37909E-01
WST =  7.50581E-01  WMT =  5.46000E-01  WPT =  4.26401E-01

  A(IK)
```

```
5.7610E-01 5.5210E-01 5.2891E-01 5.0687E-01 4.8612E-01 4.6669E-01 4.4855E-01 4.3162E-01 4.1583E-01
5.8704E-01 5.6057E-01 5.3455E-01 5.0963E-01 4.8612E-01 4.6411E-01 4.4360E-01 4.2453E-01 4.0680E-01
5.9774E-01 5.6909E-01 5.4030E-01 5.1246E-01 4.8612E-01 4.6147E-01 4.3855E-01 4.1731E-01 3.9766E-01

N = 3  X = WMM/WCR =  5.46000E-01  WT FLOW CALC =  3.06565E-02   D =  3.89826E-02


WSH =  7.41943E-01  WMH =  5.77525E-01  WPH =  4.75382E-01
WSM =  7.67166E-01  WMM =  5.77526E-01  WPM =  4.63194E-01
WST =  7.93919E-01  WMT =  5.77525E-01  WPT =  4.51021E-01

 A(IK)

5.9419E-01 5.7155E-01 5.4913E-01 5.2746E-01 5.0683E-01 4.8733E-01 4.6899E-01 4.5179E-01 4.3567E-01
6.0425E-01 5.7962E-01 5.5462E-01 5.3020E-01 5.0683E-01 4.8473E-01 4.6398E-01 4.4456E-01 4.2644E-01
6.1388E-01 5.8766E-01 5.6019E-01 5.3299E-01 5.0683E-01 4.8206E-01 4.5885E-01 4.3720E-01 4.1706E-01

N = 4  X = WMM/WCR =  5.77526E-01  WT FLOW CALC =  3.19057E-02   D = -1.78933E-04
```

FOURTH STAGE WHEEL 101 BLADES VARIABLE PASSAGE, VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	5.95000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.84490E 02	0.00000E-39	1.87400E-01
MEAN	6.75000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.84490E 02		
TIP	7.56000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.84490E 02	0.00000E-39	2.37600E-01

	BETA		
HUB	5.00000E 00	5.00000E 00	5.00000E 00
MEAN	5.00000E 00	5.00000E 00	5.00000E 00
TIP	5.00000E 00	5.00000E 00	5.00000E 00

ID1 = 0 ID2 = 5 X = 6.40000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.28633E 00 VSM = 1.33062E 00 VST = 1.37702E 00 VPH = 8.22324E-01

VPM = 8.00978E-01 VPT = 7.79929E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-4.05343E-02	2.19110E 02	-1.27176E-04
2	-3.92210E-02	2.19110E 02	-1.23056E-04
3	-3.79901E-02	2.19110E 02	-1.19194E-04
4	-3.68341E-02	2.19110E 02	-1.15567E-04
5	-3.57465E-02	2.19110E 02	-1.12154E-04
6	-3.47212E-02	2.19110E 02	-1.08938E-04
7	-3.37530E-02	2.19110E 02	-1.05900E-04
8	-3.28374E-02	2.19110E 02	-1.03027E-04
9	-3.19702E-02	2.19110E 02	-1.00307E-04

IK	M(IK)	N(IK)
1	9.54964E-04	2.18900E 02
2	7.04732E-04	2.18955E 02

```
3      4.62483E-04          2.19008E 02
4      2.27722E-04          2.19060E 02
5      0.00000E-39          2.19110E 02
6     -2.21092E-04          2.19158E 02
7     -4.35930E-04          2.19205E 02
8     -6.44858E-04          2.19251E 02
9     -8.48192E-04          2.19295E 02

 PH = -5.49708E 00   PM =  0.00000E-39   PT =  5.50202E 00

QH =  1.00096E 00   QM =  1.00000E 00   QT =  9.99152E-01


WSH =  8.36273E-01  WMH =  6.50126E-01  WPH =  5.34614E-01
WSM =  8.51596E-01  WMM =  6.40000E-01  WPM =  5.12626E-01
WST =  8.67456E-01  WMT =  6.29952E-01  WPT =  4.91317E-01

  A(IK)

6.2686E-01 6.0891E-01 5.8944E-01 5.6954E-01 5.4986E-01 5.3076E-01 5.1242E-01 4.9494E-01 4.7836E-01
6.3085E-01 6.1135E-01 5.8945E-01 5.6678E-01 5.4427E-01 5.2242E-01 5.0152E-01 4.8168E-01 4.6295E-01
6.3459E-01 6.1378E-01 5.8948E-01 5.6398E-01 5.3858E-01 5.1396E-01 4.9050E-01 4.6833E-01 4.4752E-01

N = 1  X = WMM/WCR =  6.40000E-01  WT FLOW CALC =  3.40984E-02   D = -6.89142E-02


WSH =  5.78762E-01  WMH =  4.49935E-01  WPH =  3.69992E-01
WSM =  5.85472E-01  WMM =  4.40000E-01  WPM =  3.52430E-01
WST =  5.92285E-01  WMT =  4.30121E-01  WPT =  3.35464E-01

  A(IK)

5.0761E-01 4.8180E-01 4.5803E-01 4.3622E-01 4.1622E-01 3.9787E-01 3.8101E-01 3.6549E-01 3.5116E-01
5.1186E-01 4.8257E-01 4.5562E-01 4.3096E-01 4.0845E-01 3.8790E-01 3.6911E-01 3.5192E-01 3.3614E-01
5.1611E-01 4.8333E-01 4.5316E-01 4.2564E-01 4.0063E-01 3.7793E-01 3.5730E-01 3.3853E-01 3.2141E-01

N = 2  X = WMM/WCR =  4.40000E-01  WT FLOW CALC =  2.58590E-02   D =  1.89372E-01


WSH =  7.07518E-01  WMH =  5.50030E-01  WPH =  4.52303E-01
WSM =  7.18534E-01  WMM =  5.40000E-01  WPM =  4.32528E-01
WST =  7.29871E-01  WMT =  5.30037E-01  WPT =  4.13391E-01

  A(IK)
```

```
5.7896E-01 5.5502E-01 5.3180E-01 5.0968E-01 4.8883E-01 4.6929E-01 4.5102E-01 4.3397E-01 4.1806E-01
5.8402E-01 5.5714E-01 5.3082E-01 5.0570E-01 4.8205E-01 4.5995E-01 4.3938E-01 4.2028E-01 4.0254E-01
5.8905E-01 5.5928E-01 5.2984E-01 5.0167E-01 4.7519E-01 4.5055E-01 4.2773E-01 4.0664E-01 3.8719E-01

N = 3  X = WMM/WCR =  5.40000E-01  WT FLOW CALC =  3.03787E-02   D =  4.76895E-02


WSH =  7.56903E-01  WMH =  5.88423E-01  WPH =  4.83874E-01
WSM =  7.69571E-01  WMN =  5.78356E-01  WPM =  4.63250E-01
WST =  7.82643E-01  WMT =  5.68360E-01  WPT =  4.43280E-01

  A(IK)

6.0027E-01 5.7812E-01 5.5594E-01 5.3436E-01 5.1371E-01 4.9413E-01 4.7566E-01 4.5831E-01 4.4202E-01
6.0516E-01 5.8050E-01 5.5540E-01 5.3086E-01 5.0736E-01 4.8513E-01 4.6425E-01 4.4471E-01 4.2648E-01
6.0995E-01 5.8289E-01 5.5487E-01 5.2731E-01 5.0093E-01 4.7604E-01 4.5278E-01 4.3113E-01 4.1102E-01

N = 4  X = WMM/WCR =  5.78356E-01  WT FLOW CALC =  3.19066E-02   D = -2.07439E-04
```

FOURTH STAGE WHEEL 101 BLADES VARIABLE PASSAGE, VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.07000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.82170E 02	0.00000E-39	1.87400E-01
MEAN	6.88000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.82170E 02		
TIP	7.71000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.82170E 02	0.00000E-39	2.37600E-01

	BETA		
HUB	1.50000E 01	1.50000E 01	1.50000E 01
MEAN	1.50000E 01	1.50000E 01	1.50000E 01
TIP	1.50000E 01	1.50000E 01	1.50000E 01

ID1 = 0 ID2 = 6 X = 6.28000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.29287E 00 VSM = 1.33796E 00 VST = 1.38579E 00 VPH = 8.19087E-01

VPM = 7.97562E-01 VPT = 7.76092E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-3.57456E-01	6.50671E 02	-1.12152E-03
2	-3.45875E-01	6.50671E 02	-1.08518E-03
3	-3.35020E-01	6.50671E 02	-1.05113E-03
4	-3.24826E-01	6.50671E 02	-1.01914E-03
5	-3.15234E-01	6.50671E 02	-9.89047E-04
6	-3.06193E-01	6.50671E 02	-9.60679E-04
7	-2.97655E-01	6.50671E 02	-9.33893E-04
8	-2.89581E-01	6.50671E 02	-9.08560E-04
9	-2.81933E-01	6.50671E 02	-8.84565E-04

IK	M(IK)	N(IK)
1	8.42147E-03	6.45214E 02
2	6.21476E-03	6.46640E 02

```
3      4.07846E-03          6.48023E 02
4      2.00819E-03          6.49366E 02
5      0.00000E-39          6.50671E 02
6     -1.94973E-03          6.51941E 02
7     -3.84430E-03          6.53177E 02
8     -5.68675E-03          6.54382E 02
9     -7.47988E-03          6.55556E 02

PH. = -1.62647E 01    PM =  0.00000E-39    PT =  1.63942E 01

)H =  1.00846E 00    QM =  1.00000E 00    QT =  9.92548E-01


SH =  8.55459E-01  WMH =  6.61672E-01  WPH =  5.41967E-01
WSM =  8.40238E-01  WMM =  6.28000E-01  WPM =  5.00869E-01
WST =  8.24799E-01  WMT =  5.95184E-01  WPT =  4.61917E-01

  A(IK)

5.3180E-01 6.1475E-01 5.9567E-01 5.7586E-01 5.5608E-01 5.3675E-01 5.1812E-01 5.0032E-01 4.8339E-01
6.2793E-01 6.0715E-01 5.8423E-01 5.6067E-01 5.3746E-01 5.1506E-01 4.9370E-01 4.7351E-01 4.5450E-01
6.2362E-01 5.9883E-01 5.7182E-01 5.4450E-01 5.1790E-01 4.9254E-01 4.6865E-01 4.4629E-01 4.2546E-01

N = 1  X = WMM/WCR =  6.28000E-01  WT FLOW CALC =  3.38835E-02    D = -6.21790E-02


SH =  5.94698E-01  WMH =  4.59981E-01  WPH =  3.76764E-01
SM =  5.72646E-01  WMM =  4.28000E-01  WPM =  3.41356E-01
ST =  5.49706E-01  WMT =  3.96674E-01  WPT =  3.07856E-01

  A(IK)

.1760E-01 4.9129E-01 4.6695E-01 4.4455E-01 4.2398E-01 4.0507E-01 3.8768E-01 3.7167E-01 3.5689E-01
5.0370E-01 4.7386E-01 4.4653E-01 4.2162E-01 3.9894E-01 3.7830E-01 3.5948E-01 3.4229E-01 3.2655E-01
4.8861E-01 4.5535E-01 4.2520E-01 3.9800E-01 3.7350E-01 3.5141E-01 3.3146E-01 3.1339E-01 2.9698E-01

N = 2  X = WMM/WCR =  4.28000E-01  WT FLOW CALC =  2.53994E-02    D =  2.03781E-01


WSH =  7.25078E-01  WMH =  5.60827E-01  WPH =  4.59366E-01
WSM =  7.06442E-01  WMM =  5.28000E-01  WPM =  4.21113E-01
WST =  6.87252E-01  WMT =  4.95929E-01  WPT =  3.84887E-01

  A(IK)
```

```
5.8695E-01 5.6308E-01 5.3968E-01 5.1725E-01 4.9600E-01 4.7603E-01 4.5732E-01 4.3984E-01 4.2350E-01
5.7846E-01 5.5062E-01 5.2356E-01 4.9787E-01 4.7378E-01 4.5135E-01 4.3055E-01 4.1127E-01 3.9342E-01
5.6921E-01 5.3726E-01 5.0653E-01 4.7767E-01 4.5091E-01 4.2624E-01 4.0358E-01 3.8279E-01 3.6371E-01

N = 3  X = WMM/WCR =  5.28000E-01  WT FLOW CALC =  3.00375E-02   D =  5.83847E-02


WSH =  7.84883E-01  WMH =  6.07084E-01  WPH =  4.97254E-01
WSM =  7.67813E-01  WMM =  5.73869E-01  WPM =  4.57696E-01
WST =  7.50344E-01  WMT =  5.41457E-01  WPT =  4.20220E-01

   A(IK)

6.1075E-01 5.8944E-01 5.6759E-01 5.4601E-01 5.2515E-01 5.0525E-01 4.8639E-01 4.6861E-01 4.5187E-01
6.0450E-01 5.7924E-01 5.5356E-01 5.2847E-01 5.0448E-01 4.8183E-01 4.6058E-01 4.4073E-01 4.2222E-01
5.9765E-01 5.6822E-01 5.3863E-01 5.1005E-01 4.8304E-01 4.5780E-01 4.3438E-01 4.1272E-01 3.9271E-01

N = 4  X = WMM/WCR =  5.73869E-01  WT FLOW CALC =  3.19175E-02   D = -2.34723E-04
```

FOURTH STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.17000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.78700E 02	0.00000E-39	1.87400E-01
MEAN	7.00000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.78700E 02		
TIP	7.84000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.78700E 02	0.00000E-39	2.37600E-01

	BETA		
HUB	3.000000E 01	3.000000E 01	3.000000E 01
MEAN	3.000000E 01	3.000000E 01	3.000000E 01
TIP	3.000000E 01	3.000000E 01	3.000000E 01

ID1 = 0 ID2 = 7 X = 6.14000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.29836E 00 VSM = 1.34477E 00 VST = 1.39343E 00 VPH = 8.16398E-01

VPM = 7.94421E-01 VPT = 7.72782E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-1.33404E 00	1.25700E 03	-4.18556E-03
2	-1.29082E 00	1.25700E 03	-4.04995E-03
3	-1.25031E 00	1.25700E 03	-3.92285E-03
4	-1.21227E 00	1.25700E 03	-3.80349E-03
5	-1.17647E 00	1.25700E 03	-3.69118E-03
6	-1.14273E 00	1.25700E 03	-3.58530E-03
7	-1.11086E 00	1.25700E 03	-3.48534E-03
8	-1.08073E 00	1.25700E 03	-3.39079E-03
9	-1.05219E 00	1.25700E 03	-3.30124E-03

IK	M(IK)	N(IK)
1	3.14293E-02	1.21811E 03
2	2.31938E-02	1.22818E 03

```
3      1.52210E-02          1.23801E 03
4      7.49467E-03          1.24761E 03
5      0.00000E-39          1.25700E 03
6     -7.27648E-03          1.26618E 03
7     -1.43471E-02          1.27516E 03
8     -2.12232E-02          1.28396E 03
9     -2.79153E-02          1.29258E 03

 PH = -3.10703E 01   PM =  0.00000E-39   PT =  3.20035E 01

 QH =  1.03193E 00   QM =  1.00000E 00   QT =  9.72471E-01


 WSH =  8.94624E-01  WMH =  6.89043E-01  WPH =  5.62534E-01
 WSM =  8.25689E-01  WMM =  6.14000E-01  WPM =  4.87775E-01
 WST =  7.57028E-01  WMT =  5.43283E-01  WPT =  4.19839E-01

   A(IK)

6.4005E-01 6.2567E-01 6.0824E-01 5.8938E-01 5.7009E-01 5.5095E-01 5.3229E-01 5.1432E-01 4.9712E-01
6.2388E-01 6.0165E-01 5.7757E-01 5.5317E-01 5.2928E-01 5.0636E-01 4.8462E-01 4.6414E-01 4.4491E-01
6.0032E-01 5.7072E-01 5.4076E-01 5.1175E-01 4.8428E-01 4.5861E-01 4.3478E-01 4.1274E-01 3.9240E-01

 N = 1  X = WMM/WCR =  6.14000E-01  WT FLOW CALC =  3.32328E-02   D = -4.17819E-02


 WSH =  8.27634E-01  WMH =  6.37447E-01  WPH =  5.20411E-01
 WSM =  7.58450E-01  WMM =  5.64000E-01  WPM =  4.48154E-01
 WST =  6.89274E-01  WMT =  4.94659E-01  WPT =  3.82264E-01

   A(IK)

6.2444E-01 6.0520E-01 5.8451E-01 5.6351E-01 5.4283E-01 5.2286E-01 5.0376E-01 4.8562E-01 4.6847E-01
6.0088E-01 5.7469E-01 5.4825E-01 5.2255E-01 4.9809E-01 4.7505E-01 4.5351E-01 4.3343E-01 4.1475E-01
5.7020E-01 5.3777E-01 5.0653E-01 4.7718E-01 4.4998E-01 4.2492E-01 4.0193E-01 3.8085E-01 3.6151E-01

 N = 2  X = WMM/WCR =  5.64000E-01  WT FLOW CALC =  3.13649E-02   D =  1.68009E-02


 WSH =  8.61129E-01  WMH =  6.63245E-01  WPH =  5.41472E-01
 WSM =  7.92070E-01  WMM =  5.89000E-01  WPM =  4.67914E-01
 WST =  7.23151E-01  WMT =  5.18971E-01  WPT =  4.01051E-01

   A(IK)
```

6.3315E-01 6.1619E-01 5.9700E-01 5.7697E-01 5.5691E-01 5.3729E-01 5.1836E-01 5.0026E-01 4.8305E-01
6.1325E-01 5.8886E-01 5.6347E-01 5.3832E-01 5.1407E-01 4.9103E-01 4.6934E-01 4.4901E-01 4.3003E-01
5.8609E-01 5.5489E-01 5.2415E-01 4.9487E-01 4.6745E-01 4.4203E-01 4.1857E-01 3.9698E-01 3.7711E-01

N = 3 X = WMM/WCR = 5.89000E-01 WT FLOW CALC = 3.23255E-02 D = -1.33396E-02

WSH = 8.46071E-01 WMH = 6.51648E-01 WPH = 5.32004E-01
WSM = 7.76956E-01 WMM = 5.77761E-01 WPM = 4.58986E-01
WST = 7.07921E-01 WMT = 5.08041E-01 WPT = 3.92605E-01

A(IK)

6.2946E-01 6.1143E-01 5.9154E-01 5.7105E-01 5.5169E-01 5.3089E-01 5.1187E-01 4.9375E-01 4.7656E-01
6.0790E-01 5.8266E-01 5.5677E-01 5.3135E-01 5.0698E-01 4.8392E-01 4.6229E-01 4.4207E-01 4.2321E-01
5.7915E-01 5.4735E-01 5.1635E-01 4.8702E-01 4.5968E-01 4.3441E-01 4.1114E-01 3.8977E-01 3.7013E-01

N = 4 X = WMM/WCR = 5.77761E-01 WT FLOW CALC = 3.18999E-02 D = 3.40492E-06

FOURTH STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19000E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
HUB	6.29000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.75810E 02	0.00000E-39	1.87400E-01
MEAN	7.13000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.75810E 02		
TIP	7.99000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.75810E 02	0.00000E-39	2.37600E-01

	BETA		
HUB	4.50000E 01	4.50000E 01	4.50000E 01
MEAN	4.50000E 01	4.50000E 01	4.50000E 01
TIP	4.50000E 01	4.50000E 01	4.50000E 01

ID1 = 0 ID2 = 8 X = 6.[illegible]E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.30497E 00 VSM = 1.35219E 00 VST = 1.40231E 00 VPH = 8.13183E-01

VPM = 7.91033E-01 VPT = 7.68980E-01

IK	LITTLE A	LITTLE B	ALPHA
1	-2.66809E 00	1.77767E 03	-8.37113E-03
2	-2.58164E 00	1.77767E 03	-8.09991E-03
3	-2.50062E 00	1.77767E 03	-7.84571E-03
4	-2.42454E 00	1.77767E 03	-7.60698E-03
5	-2.35294E 00	1.77767E 03	-7.38235E-03
6	-2.28545E 00	1.77767E 03	-7.17061E-03
7	-2.22173E 00	1.77767E 03	-6.97067E-03
8	-2.16146E 00	1.77767E 03	-6.78158E-03
9	-2.10438E 00	1.77767E 03	-6.60248E-03

IK	M(IK)	N(IK)
1	6.28587E-02	1.66936E 03
2	4.63876E-02	1.69709E 03

```
3      3.04420E-02          1.72437E 03
4      1.49893E-02          1.75122E 03
5      0.00000E-39          1.77767E 03
6     -1.45530E-02          1.80373E 03
7     -2.86942E-02          1.82941E 03
8     -4.24465E-02          1.85475E 03
9     -5.58306E-02          1.87974E 03

 PH = -4.32745E 01   PM =  0.00000E-39   PT =  4.59123E 01

QH =  1.06488E 00   QM =  1.00000E 00   QT =  9.45699E-01


WSH =  9.41927E-01  WMH =  7.21801E-01  WPH =  5.86957E-01
WSM =  8.15370E-01  WMM =  6.03000E-01  WPM =  4.76993E-01
WST =  6.94393E-01  WMT =  4.95180E-01  WPT =  3.80783E-01

  A(IK)

6.4664E-01 6.3618E-01 6.2123E-01 6.0390E-01 5.8549E-01 5.6678E-01 5.4825E-01 5.3020E-01 5.1279E-01
6.2080E-01 5.9741E-01 5.7237E-01 5.4719E-01 5.2268E-01 4.9927E-01 4.7713E-01 4.5634E-01 4.3688E-01
5.7271E-01 5.3980E-01 5.0800E-01 4.7829E-01 4.5036E-01 4.2482E-01 4.0140E-01 3.7994E-01 3.6027E-01

N = 1  X = WMM/WCR =  6.03000E-01  WT FLOW CALC =  3.27946E-02   D = -2.80444E-02


WSH =  8.72446E-01  WMH =  6.68558E-01  WPH =  5.43660E-01
WSM =  7.47760E-01  WMM =  5.53000E-01  WPM =  4.37441E-01
WST =  6.28085E-01  WMT =  4.47895E-01  WPT =  3.44422E-01

  A(IK)

6.3569E-01 6.1920E-01 6.0013E-01 5.7999E-01 5.5970E-01 5.3978E-01 5.2052E-01 5.0208E-01 4.8454E-01
5.9660E-01 5.6937E-01 5.4212E-01 5.1578E-01 4.9082E-01 4.6740E-01 4.4556E-01 4.2527E-01 4.0643E-01
5.3751E-01 5.0311E-01 4.7102E-01 4.4154E-01 4.1463E-01 3.9015E-01 3.6790E-01 3.4766E-01 3.2922E-01

N = 2  X = WMM/WCR =  5.53000E-01  WT FLOW CALC =  3.08876E-02   D =  3.17375E-02


WSH =  9.07186E-01  WMH =  6.95180E-01  WPH =  5.65309E-01
WSM =  7.81565E-01  WMM =  5.78000E-01  WPM =  4.57217E-01
WST =  6.61239E-01  WMT =  4.71537E-01  WPT =  3.62603E-01

  A(IK)
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6.4217E-01 6.2852E-01 6.1137E-01 5.9253E-01 5.7309E-01 5.5370E-01 5.3475E-01 5.1646E-01 4.9894E-01
6.0957E-01 5.8409E-01 5.5781E-01 5.3195E-01 5.0713E-01 4.8365E-01 4.6161E-01 4.4103E-01 4.2185E-01
5.5585E-01 5.2202E-01 4.8996E-01 4.6017E-01 4.3278E-01 4.0772E-01 3.8484E-01 3.6396E-01 3.4487E-01

N = 3 X = WMM/WCR = 5.78000E-01 WT FLOW CALC = 3.18680E-02 D = 1.00406E-03

WSH = 9.08354E-01 WMH = 6.96075E-01 WPH = 5.66336E-01
WSM = 7.82702E-01 WMM = 5.78841E-01 WPM = 4.57882E-01
WST = 6.62354E-01 WMT = 4.72332E-01 WPT = 3.63214E-01

A(IK)

6.4235E-01 6.2880E-01 6.1173E-01 5.9293E-01 5.7352E-01 5.5415E-01 5.3522E-01 5.1693E-01 4.9942E-01
6.0997E-01 5.8456E-01 5.5831E-01 5.3247E-01 5.0766E-01 4.8418E-01 4.6214E-01 4.4155E-01 4.2236E-01
5.5644E-01 5.2264E-01 4.9058E-01 4.6078E-01 4.3338E-01 4.0839E-01 3.8540E-01 3.6450E-01 3.4540E-01

N = 4 X = WMM/WCR = 5.78841E-01 WT FLOW CALC = 3.19003E-02 D = -3.12924E-07

FOURTH STAGE WHEEL 101 BLADES VARIABLE PASSAGE,VELOCITY AND DENSITY

ITERATIVE METHOD ADJUSTED BLADE HEIGHT 8/5/66

NLIM = 5 TLIM = 0.0010

GAMMA = 1.66700E 00 OMEGA = 1.25700E 03 WGIVEN = 3.19300E-02

	N - ZERO	C-SUB-S	C-SUB-P	W-SUB-CR	RHO W CR	1/R SUB C	R
B	6.36000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.74660E 02	0.00000E-39	1.87400E-01
AN	7.21000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.74660E 02		
P	8.08000E-03	9.79600E 01	5.89700E 01	5.78330E 02	1.74660E 02	0.00000E-39	2.37600E-01

	BETA		
B	5.50000E 01	5.50000E 01	5.50000E 01
AN	5.50000E 01	5.50000E 01	5.50000E 01
P	5.50000E 01	5.50000E 01	5.50000E 01

ID1 = 0 ID2 = 9 X = 6.00000E-01 JX = 2 JY = 2 JZ = 3

KR4 = 0 KR5 = 0 KR6 = 2 KR7 = 1

VSH = 1.30884E 00 VSM = 1.35677E 00 VST = 1.40766E 00 VPH = 8.11314E-01

VPM = 7.88955E-01 VPT = 7.66708E-01

K	LITTLE A	LITTLE B	ALPHA
	-3.58063E 00	2.05935E 03	-1.12342E-02
	-3.46462E 00	2.05935E 03	-1.08702E-02
	-3.35589E 00	2.05935E 03	-1.05291E-02
	-3.25378E 00	2.05935E 03	-1.02087E-02
	-3.15769E 00	2.05935E 03	-9.90726E-03
	-3.06712E 00	2.05935E 03	-9.62310E-03
	-2.98160E 00	2.05935E 03	-9.35478E-03
	-2.90072E 00	2.05935E 03	-9.10102E-03
	-2.82412E 00	2.05935E 03	-8.86066E-03

K	M(IK)	N(IK)
	8.43576E-02	1.89275E 03
	6.22531E-02	1.93506E 03

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3      4.08538E-02          1.97691E 03
4      2.01160E-02          2.01834E 03
5      0.00000E-39          2.05935E 03
6     -1.95304E-02          2.09996E 03
7     -3.85082E-02          2.14020E 03
8     -5.69640E-02          2.18006E 03
9     -7.49257E-02          2.21957E 03

 PH = -4.96133E 01    PM =  0.00000E-39    PT =  5.37128E 01

QH =  1.08802E 00    QM =  1.00000E 00    QT =  9.27812E-01


WSH =  9.76588E-01  WMH =  7.46149E-01  WPH =  6.05361E-01
WSM =  8.14064E-01  WMM =  6.00000E-01  WPM =  4.73373E-01
WST =  6.62325E-01  WMT =  4.70516E-01  WPT =  3.66749E-01

  A(IK)

6.4906E-01 6.4201E-01 6.2931E-01 6.1344E-01 5.9594E-01 5.7776E-01 5.5951E-01 5.4156E-01 5.2411E-01
6.2040E-01 5.9664E-01 5.7122E-01 5.4568E-01 5.2086E-01 4.9716E-01 4.7479E-01 4.5379E-01 4.3416E-01
5.5642E-01 5.2224E-01 4.8981E-01 4.5969E-01 4.3203E-01 4.0669E-01 3.8363E-01 3.6253E-01 3.4329E-01

N = 1  X = WMM/WCR =  6.00000E-01  WT FLOW CALC =  3.27487E-02   D = -2.66038E-02


WSH =  9.05386E-01  WMH =  6.91748E-01  WPH =  5.61225E-01
WSM =  7.46226E-01  WMM =  5.50000E-01  WPM =  4.33925E-01
WST =  5.97023E-01  WMT =  4.24126E-01  WPT =  3.25181E-01

  A(IK)

6.4188E-01 6.2789E-01 6.1038E-01 5.9119E-01 5.7142E-01 5.5173E-01 5.3251E-01 5.1399E-01 4.9626E-01
5.9597E-01 5.6835E-01 5.4073E-01 5.1407E-01 4.8881E-01 4.6515E-01 4.4310E-01 4.2264E-01 4.0365E-01
5.1904E-01 4.8401E-01 4.5177E-01 4.2243E-01 3.9584E-01 3.7179E-01 3.5003E-01 3.3030E-01 3.1237E-01

N = 2  X = WMM/WCR =  5.50000E-01  WT FLOW CALC =  3.08326E-02   D =  3.34624E-02


WSH =  9.40987E-01  WMH =  7.18948E-01  WPH =  5.83293E-01
WSM =  7.80145E-01  WMM =  5.75000E-01  WPM =  4.53649E-01
WST =  6.29674E-01  WMT =  4.47321E-01  WPT =  3.42965E-01

  A(IK)
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6.4654E-01 6.3584E-01 6.2059E-01 6.0294E-01 5.8421E-01 5.6520E-01 5.4641E-01 5.2811E-01 5.1049E-01
6.0906E-01 5.8319E-01 5.5653E-01 5.3033E-01 5.0521E-01 4.8147E-01 4.5921E-01 4.3844E-01 4.1910E-01
5.3842E-01 5.1365E-01 4.7120E-01 4.4138E-01 4.1418E-01 3.8945E-01 3.6698E-01 3.4655E-01 3.2795E-01

N = 3 X = WMM/WCR = 5.75000E-01 WT FLOW CALC = 3.18176E-02 D = 2.58238E-03

WSH = 9.44056E-01 WMH = 7.21293E-01 WPH = 5.85195E-01
WSM = 7.83069E-01 WMM = 5.77155E-01 WPM = 4.55349E-01
WST = 6.32489E-01 WMT = 4.49528E-01 WPT = 3.44497E-01

A(IK)

6.4685E-01 6.3644E-01 6.2140E-01 6.0389E-01 5.8526E-01 5.6632E-01 5.4757E-01 5.2930E-01 5.1168E-01
6.1011E-01 5.8440E-01 5.5784E-01 5.3169E-01 5.0659E-01 4.8285E-01 4.6057E-01 4.3978E-01 4.2041E-01
5.4003E-01 5.0529E-01 4.7284E-01 4.4299E-01 4.1574E-01 3.9096E-01 3.6843E-01 3.4794E-01 3.2928E-01

N = 4 X = WMM/WCR = 5.77155E-01 WT FLOW CALC = 3.19000E-02 D = -8.19564E-07